PB85-242436

# Element Pattern Measurements on FM Antennas

Micro Communications, Inc., Manchester, NH

Prepared for

Office of Radiation Programs
Las Vegas Facility, NV

Jun 85

U.S. Department of Commerce
National Technical Information Service
NTIS

United States
Environmental Protection
Agency

Office of Radiation Programs
Nonionizing Radiation Branch
P.O. Box 18416
Las Vegas NV 89114-8416

EPA-520/6-85-017
June 1985

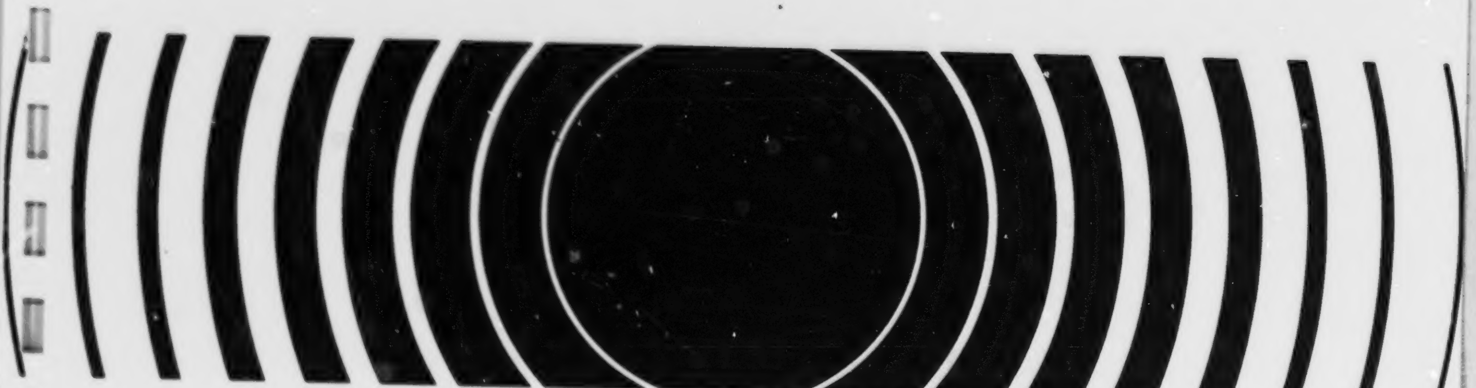
Radiation

PB85-242436

EPA

# Element Pattern Measurements On FM Antennas

29



REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

# DISCLAIMER

Although the work described in this document has been funded wholly by the United States Environmental Protection Agency it has not been subjected to the Agency's required peer and policy review and therefore does not necessarily reflect the views of the Agency. No official endorsement should be inferred.

50272-101

**REPORT DOCUMENTATION PAGE**

**1. REPORT NO.** EPA 520/6-85-017

**2.**

**3. Recipient's Accession No.** PB85 242436 /AS

**4. Title and Subtitle**
Element Pattern Measurements on FM Antennas

**5. Report Date**

**6.**

**7. Author(s)**
Micro Communications Inc.

**8. Performing Organization Rept. No.**

**9. Performing Organization Name and Address**
Micro Communications Inc.
Grenier Field, P.O. Box 4365
Manchester, NH 03108

**10. Project/Task/Work Unit No.**

**11. Contract(C) or Grant(G) No.**
(C)
(G)

**12. Sponsoring Organization Name and Address**
U.S. Environmental Protection Agency
Office of Radiation Programs
Nonionizing Radiation Branch
P.O. Box 18416, Las Vegas, NV 89114-8416

**13. Type of Report & Period Covered**

**14.**

**15. Supplementary Notes**

**16. Abstract (Limit: 200 words)**

This contractor-developed report contains data obtained from measurements of the elevation radiation patterns of five commercial FM radio broadcast antenna elements. Pattern measurements were performed with the elements supported by a dielectric mast and when mounted on a section of triangular tower. Measurements were accomplished for the elevation plane throughout 360 degrees of elevation and at azimuthal angles separated by 45 degrees to fully characterize the effect of the tower on the elevation plane pattern.

**17. Document Analysis a. Descriptors**

**b. Identifiers/Open-Ended Terms**

**c. COSATI Field/Group**

**18. Availability Statement**
from NTIS

**19. Security Class (This Report)**

**20. Security Class (This Page)**

**21. No. of Pages**

**22. Price**

(See ANSI–Z39.18)

*See Instructions on Reverse*

OPTIONAL FORM
(Formerly NTIS
Department o

DATA
DATA
DATA
DATA
DATA
DATA
DATA
DATA
DATA
DATA
DATA
DATA
DATA
DATA
DATA
DATA
DATA
DATA

ILTERS & DIPLEXERS • SWITCHES; COAX & WAVEGUIDE • CIRCULAR POLARIZED TV & FM ANTENNAS

**micro**
**communications**
**inc.**

# ELEMENT PATTERN MEASUREMENTS
# ON
# FM ANTENNAS

FOR
ENVIRONMENTAL PROTECTION AGENCY
CONTRACT #68-03-3054

FINAL
REPORT #1310

MARCH 16, 1983

## -INDEX-

PAGE

2 I INTRODUCTION

3 II TEST FACILITY'S DESCRIPTION
- REQUIREMENTS
- RANGE
- MEASUREMENT AND RECORDING EQUIPMENT

10 III PATTERN MEASUREMENT
- 11 DEFINITION OF CUTS
- 14 CONSIDERATIONS IN MEASUREMENT
  - 14 (1) PARALLAX AND TOWER EFFECTS
  - 15 (2) MOUNTING PECULIARTIES AND FEED STRUCTURES
  - 17 (3) POLARIZATION
  - 18 (4) RANGE GEOMETRY
  - 19 (5) MULTIPATH EFFECT
  - 20 (6) MEASUREMENT COORDINATES
  - 23 (7) RECORDING PAPER COORDINATES
  - 23 (8) AXIAL RATIO CRITERIA
  - 27 (9) TEST SEQUENCES

30 IV PATTERN MEASUREMENT
- MODEL A
  - 31 FREE SPACE MEASUREMENTS
  - 43 FACE MOUNTED MEASUREMENTS
  - 58 LEG MOUNTED MEASUREMENTS

- MODEL B
  - 72 FREE SPACE MEASUREMENTS
  - 84 FACE MOUNTED MEASUREMENTS
  - 97 LEG MOUNTED MEASUREMENTS

- MODEL C
  - 112 FREE SPACE MEASUREMENTS
  - 124 FACE MOUNTED MEASUREMENTS
  - 136 LEG MOUNTED MEASUREMENTS

PAGE

MODEL D
151 FREE SPACE MEASUREMENTS
165 FACE MOUNTED MEASUREMENTS
178 LEG MOUNTED MEASUREMENTS

MODEL E
192 FREE SPACE MEASUREMENTS
204 FACE MOUNTED MEASUREMENTS
219 LEG MOUNTED MEASUREMENTS

MODEL F
232 FREE SPACE MEASUREMENTS
239 FACE MOUNTED MEASUREMENTS
242 LEG MOUNTED MEASUREMENTS

245 V SUMMARY OF MEASURED PATTERNS
246 MODEL A
250 MODEL B
254 MODEL C
258 MODEL D
262 MODEL E
266 MODEL F

270 VI RANGE CALIBRATION
STANDARD DIPOLE DATA - ANTENNA F

# PURPOSE

The purpose of this program was to measure element patterns of typical FM antennas to permit EPA to develop a typical representative single element elevation pattern of each antenna

Using the typical element pattern (which will permit the EPA) to in turn calculate the elevation pattern of a multi-element array.

From the multi-element array pattern it would be possible to determine the Power Density near the ground in the vicinity of the transmitting tower.

## I INTRODUCTION

The purpose of this study was to measure element patterns of some commercially available "circularly polarized" FM broadcast antennas. Patterns are presented for both "free space" and "tower mounted" configurations. "Free space" patterns on a single element as received from the manufacturer include bracket supports or extension of the backbone as recommended by the manufacturer. Each element represented the manufactured version of the element.

"Tower mounted" patterns, likewise, were measured on the "standard tower" at the distance from the tower recommended by the manufacturer.

Sufficient data is presented to enable the knowledgable reader to calculate array patterns for standard variants of mounting and excitation. It is not part of the purpose of this study to provide detailed analysis of the results.

## II TEST FACILITY'S DESCRIPTION

### Requirements

The physical facility must have sufficient space for the measurements and the apparatus involved. In addition, the facility should provide for variable range and height above ground, as well as for suitable rotational flexibility. The site must also be relatively free from interference. The large volume of data to be produced demanded that the recording and positional/attitudinal systems be slaved, and that the entire process be automated.

### Range

Figure 1 is a drawing of the facility and range. The pattern range selected was centered on a concrete runway (flat ±½") extending to 300 ft. northwesterly from the building housing the test and recording equipment. The antenna under test was mounted on a Scientific Atlanta 58000 Model Tower (see Figures 2 and 3). The model tower was itself mounted on a motorized vehicle which could be driven along the runway to provide range variation.

The RF signal received by the antenna under test was connected to the recording/control building via a coaxial cable. Servo control and information were obtained remotely from the recording/control building. A Scientific Atlanta Model 29C-0.2 (Figure 4) log-periodic dipole was mounted on a transmitting tower (Figure 5) at the building end of the runway. HAG of the transmitting antenna could be adjusted by hand-held control. Rotation of the antenna for polarization measurements was also done remotely.

### Measurement and Recording Equipment

The Scientific Atlanta Pattern Recorder Control System is shown in block diagram form in Figure 6. After range and height adjustments were completed, the pattern measurement was automatically recorded via pre-programmed instructions. The enclosed patterns are photocopies of the original plots.

## AVCO TEST RANGE

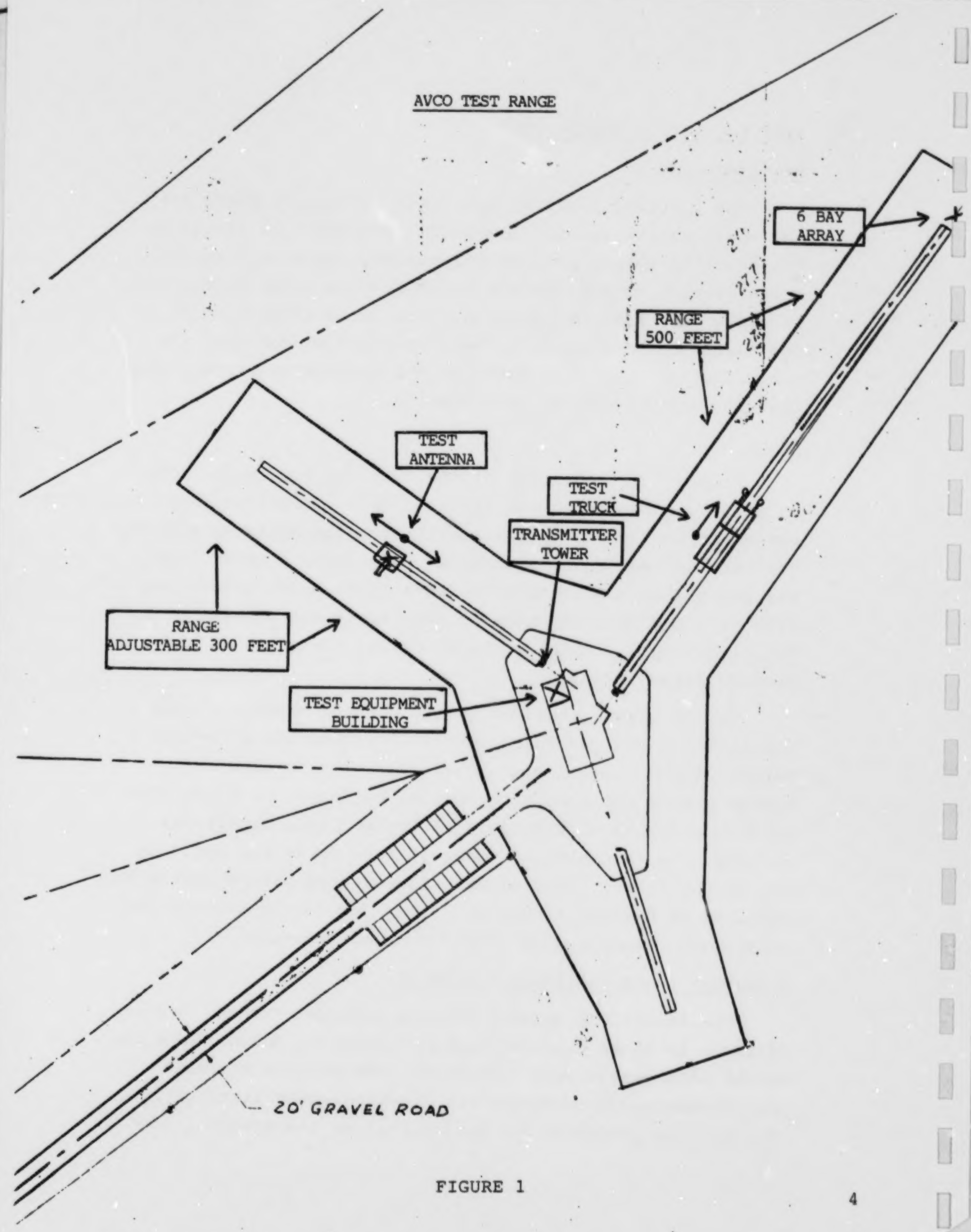
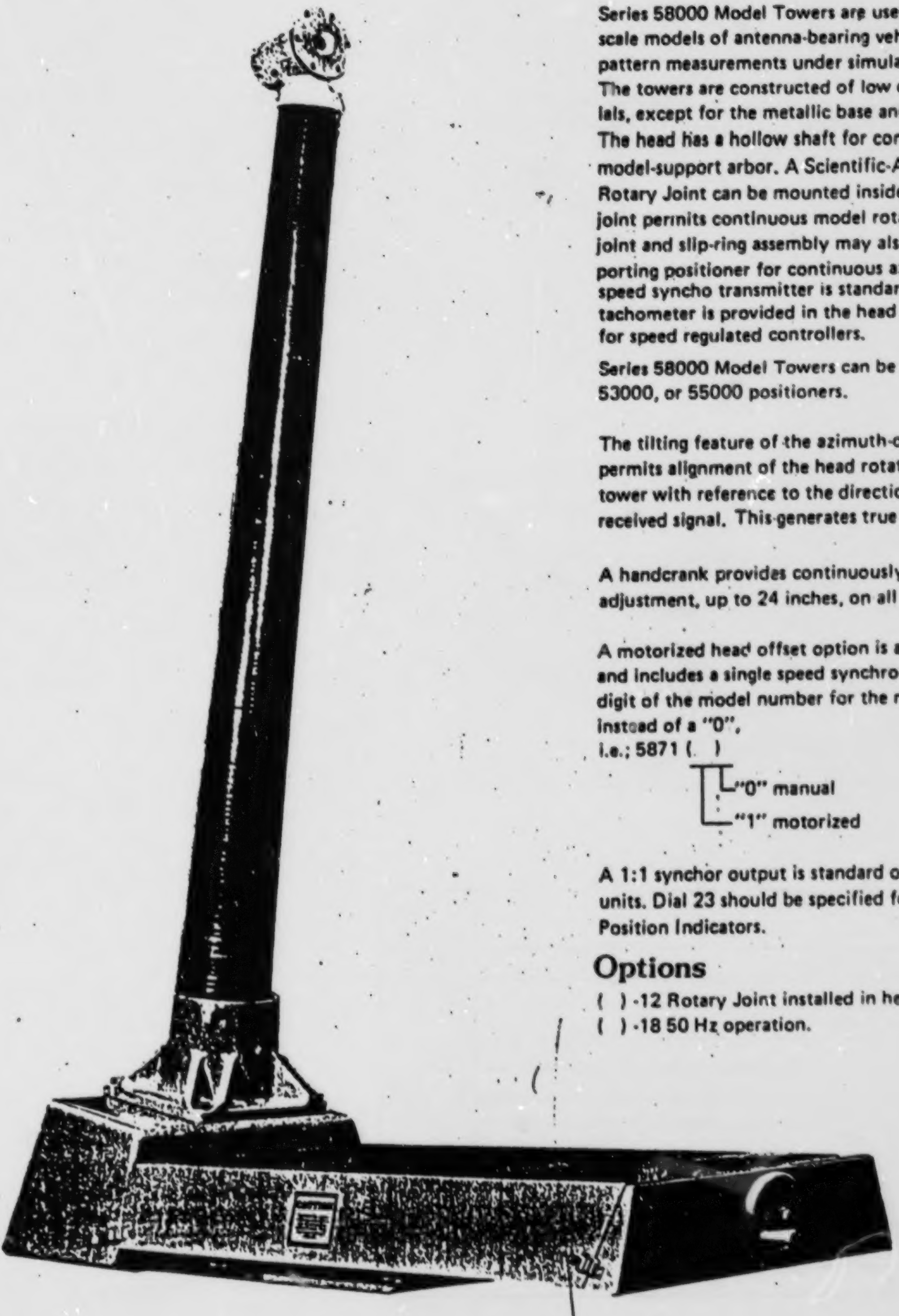

6 BAY ARRAY
RANGE 500 FEET
TEST ANTENNA
TEST TRUCK
TRANSMITTER TOWER
RANGE ADJUSTABLE 300 FEET
TEST EQUIPMENT BUILDING
20' GRAVEL ROAD

FIGURE 1

# Model Towers

## Series 58000



Series 58000 Model Towers are used to support and position scale models of antenna-bearing vehicles when making antenna pattern measurements under simulated free-space conditions. The towers are constructed of low dielectric-constant materials, except for the metallic base and model-support head. The head has a hollow shaft for conveniently attaching the model-support arbor. A Scientific-Atlanta Series 10 Coaxial Rotary Joint can be mounted inside this arbor. The rotary joint permits continuous model rotation. A coaxial rotary joint and slip-ring assembly may also be installed in the supporting positioner for continuous azimuth rotation. A two speed syncho transmitter is standard in the head axis. A tachometer is provided in the head axis to provide feedback for speed regulated controllers.

Series 58000 Model Towers can be used with Series 51000, 53000, or 55000 positioners.

The tilting feature of the azimuth-over-elevation positioner permits alignment of the head rotation axis of the model tower with reference to the direction of propagation of the received signal. This generates true $\phi$ and $\theta$ cuts.

A handcrank provides continuously variable head-face-offset adjustment, up to 24 inches, on all model towers.

A motorized head offset option is available on all models and includes a single speed synchro transmitter. The last digit of the model number for the motorized unit is a "1" instead of a "0",
i.e.; 5871 ( )
"0" manual
"1" motorized

A 1:1 synchor output is standard on all motorized offset units. Dial 23 should be specified for use with Model 4400 Position Indicators.

## Options

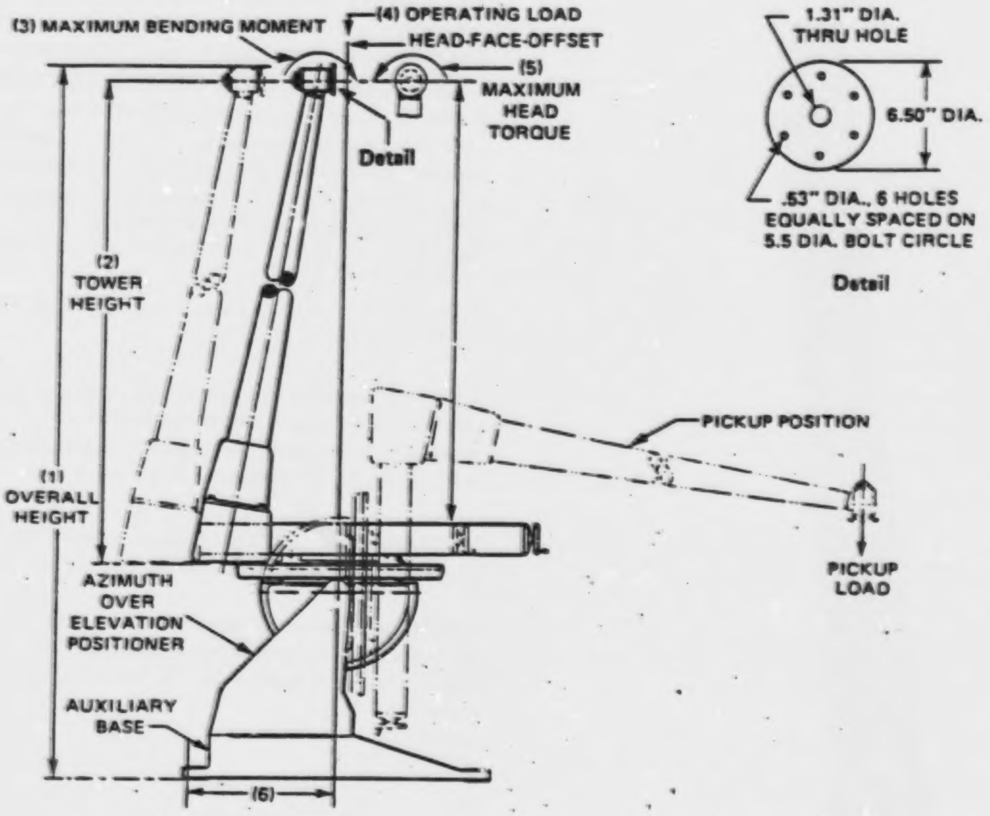
( ) -12 Rotary Joint installed in head.
( ) -18 50 Hz operation.

Figure 2

Scientific Atlanta
79

# Model Towers

## Series 58000


(3) MAXIMUM BENDING MOMENT
(4) OPERATING LOAD
HEAD-FACE-OFFSET
(5) MAXIMUM HEAD TORQUE
Detail
(2) TOWER HEIGHT
(1) OVERALL HEIGHT
AZIMUTH OVER ELEVATION POSITIONER
AUXILIARY BASE
(6)
PICKUP POSITION
PICKUP LOAD
1.31" DIA. THRU HOLE
6.50" DIA.
.53" DIA., 6 HOLES EQUALLY SPACED ON 5.5 DIA. BOLT CIRCLE
Detail

| Characteristics – Model No. | 58730A/<br>58731A |
|---|---|
| (1) Overall Height on Azimuth Positioner | 26' 4" |
| Suggested Azimuth Positioner | 51300 |
| (1) Overall Ht. on AZ/EL/Positioner | 29' - 5" |
| Suggested AZ/EL/Positioner | 53300 |
| (2) Tower Height | 24'-10" |
| (3) Maximum Bending Moment (lb-ft) | 2000 |
| (4) Maximum Operating Load (lbs) | 500 |
| (5) Maximum Head Torque (lb-ft) | 75 |
| (6) Arm Swing Clearance | 7' - 8" |
| Maximum Load Inertia (Slug-ft) | 160 |
| Maximum Head Speed (rpm) | 1 |
| Arm Travel (Head-Face-Offset) | 0" - 24" |
| Net Weight (lbs) | 1,000 |
| Shipping Weight (lbs) | 1,350 |

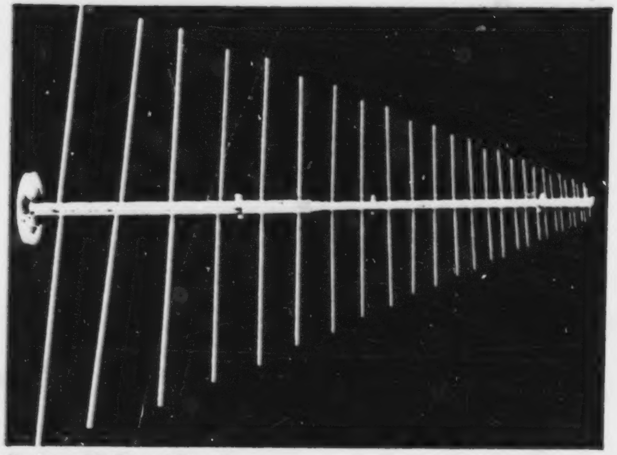
Figure 3

Scientific Atlanta

54

# Broadband Antennas

## Series 26

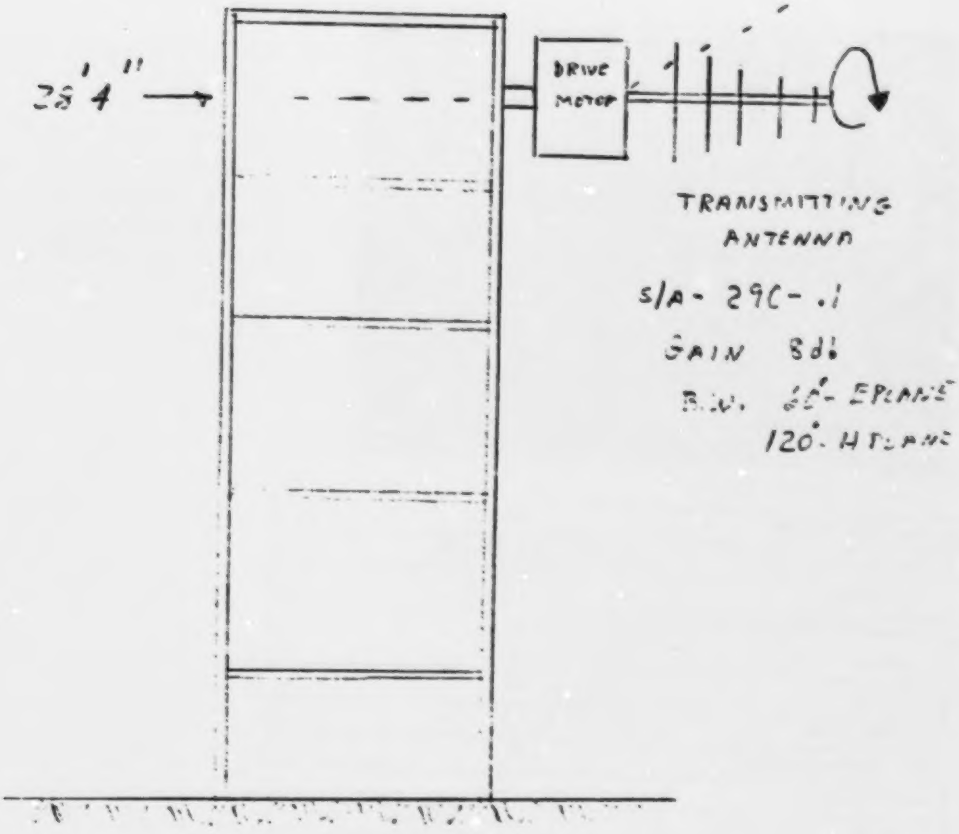


Series 26 Antennas are log-periodic dipole antennas specifically designed for VHF and UHF antenna test ranges. Each array has essentially constant gain, beamwidth, and input Impedance over its design frequency range. Series 26 E- and H-plane patterns for any three frequencies can be supplied at an additional cost. A mounting flange at the rear of the array allows the antenna to be attached to any Scientific-Atlanta Series 56000 Polarization Positioner.

Series 26 Specifications

| Array Model Number | Model 26-0.1 |
|---|---|
| Frequency Range (GHz) | 0.10 to 1.00 |
| Nominal Gain | 8 dB |
| Nominal Beamwidth (degrees)<br>E-Plane | 60 |
| H-Plane | 120 |
| Maximum VSWR | 2.0 |
| Input Impedance (ohms.) | 50 |
| Power (watts) | 100 |
| Connector | Type "N" Female |
| Max. Front to Back Ratio, down | -20 dB |
| Max. Cross Polarization, down | -25 dB |
| Approx. Max. Projected Wind Area (in.$^2$) | 138 |
| Approx. Center of Gravity | 24 in. from mtng flange |
| Max Wind Loading At<br>100 MPH no ice or<br>50 MPH ½" ice (FT. LBS) | 55 |
| Power (Watts)<br>Peak | 2500 |
| Average | 600 |
| Dimension, Inches (cm)<br>Length | 71±1.0<br>(180 ±3) |
| Width | 60±1 (152±3) |
| Weight, Pounds (kg)<br>Net | 11 (5) |
| Shipping | 100 (45) |
| Shipping volume (cu. ft.) | 45 |

Figure 4

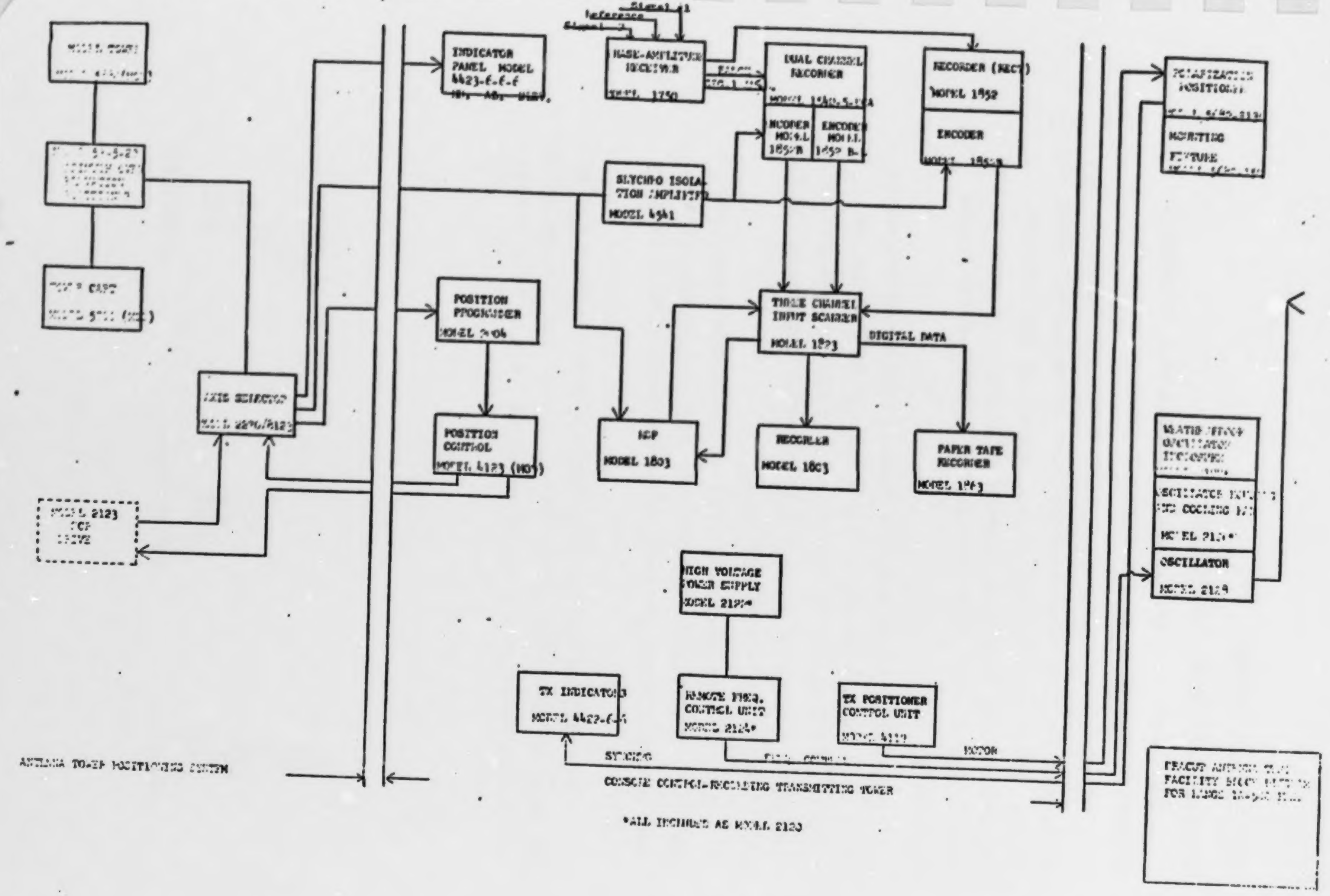

28'4"
DRIVE MOTOR
TRANSMITTING ANTENNA
S/A - 29C-.1
GAIN 8db
B.W. 66°- EPLANE
120°- H PLANE

TRANSMITTER TOWER

Note: Transmitting Antenna Remotely
(a) Adjustable in Height 6 - 29 Ft.
(b) Rotatable - 360° about it's Radiation Axis
(c) Tiltable - 5° to +30° in Elevation

FIGURE 5

PATTERN # [illegible] DATE [illegible]


Signal #1
Reference
Signal #2
INDICATOR PANEL MODEL 4423-6-6-6
PHASE-AMPLITUDE RECEIVER
MODEL 1750
DUAL CHANNEL RECORDER
ENCODER MODEL
ENCODER MODEL
RECORDER (RECT)
MODEL 1952
ENCODER
POLARIZATION POSITIONER
MOUNTING FIXTURE
SYNCHRO ISOLATION AMPLIFIER
MODEL 4941
AXIS SELECTOR
POSITION PROGRAMMER
POSITION CONTROL
MODEL 4123
THREE CHANNEL INPUT SCANNER
MODEL 1823
DIGITAL DATA
MODEL 2123
DRIVE
NDP
MODEL 1803
RECORDER
MODEL 1803
PAPER TAPE RECORDER
MODEL 1863
OSCILLATOR
HIGH VOLTAGE POWER SUPPLY
TX INDICATOR
REMOTE FREQ. CONTROL UNIT
TX POSITIONER CONTROL UNIT
SYNCHRO
MOTOR
ANTENNA TOWER POSITIONING SYSTEM
CONSOLE CONTROL-RECEIVING TRANSMITTING TOWER
*ALL INCLUDED AS MODEL 2120

SCIENTIFIC ATLANTA RECORDING SYSTEM

Figure 6

## III PATTERN MEASUREMENT

### Selection of Range Parameters

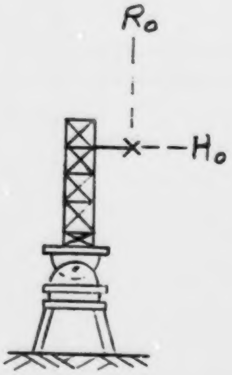
The prime purpose of this program was to measure elevation patterns on the typical tower.

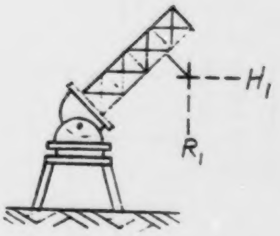
Measuring Circular Polarized Broadcast Antennas are difficult in that the antennas must be measured about the ℄ of the tower and not the phase center of the antenna. Therefore, the distance between transmitting antenna and test antenna will vary and/or the height above ground will vary.

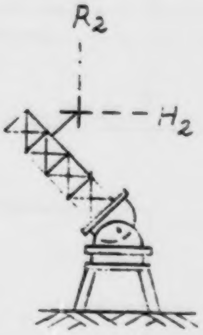
For either variable the ground reflected component will introduce a variable amplitude error, which is further complicated by the fact that the ground reflected signal is different from the horizontal component than from the vertical component.

If a conventional El over Az turntable were used, the distance between antennas Rx and the height of the test antenna above ground, Hx would vary with elevation angle.

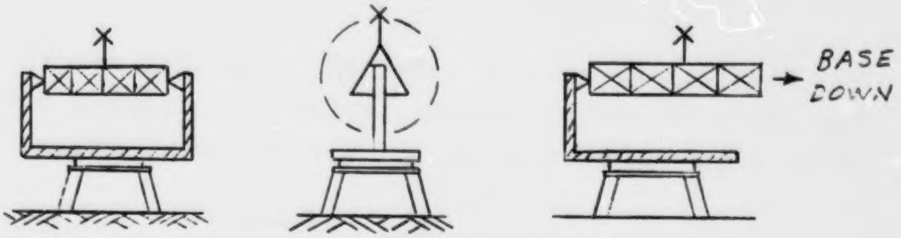
In addition to the measurement error, one would not be able to make full great circle cuts, and the pedestal mount radiation would be an integral part of the results.







Because of the large physical size, broadcast antennas are normally measured with the antenna tower combination mounted in the horizontal plane



The azimuth pattern is taken by rotating the tower about its axis and the elevation pattern by rotation of the turntable. To minimize mount reradiation the tower was mounted on one side. In this manner the measured patterns would more represent the true tower mounted signal at the tower base, and the antenna is above the axis of rotation for all elevation patterns.

A sketch of the Test Facilities is shown (see Figure 7).

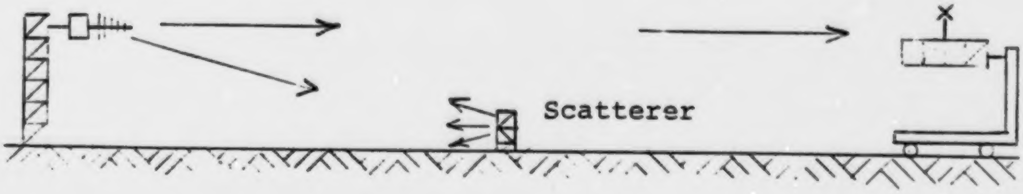


Figure 7

## Definition of Cuts

Azimuth - Figure 8 is a sketch of an antenna element mounted on a tower. The phrase "azimuthal cut" refers to the pattern on the element lying in a plane parallel to the surface of the earth and containing the antenna. The pattern is taken at a constant distance, R, from the center of the tower at the height of the antenna under test. Whether the measurement antenna moves around the tower or the tower itself is made to rotate is a matter of convenience. The azimuthal cut gives the relative field strength alone a equitorial circle of radius R.

The azimuth pattern referred to in this report, whether free space or tower mounted, is the same azimuth pattern if the antenna was mounted on a tower in normal usage.

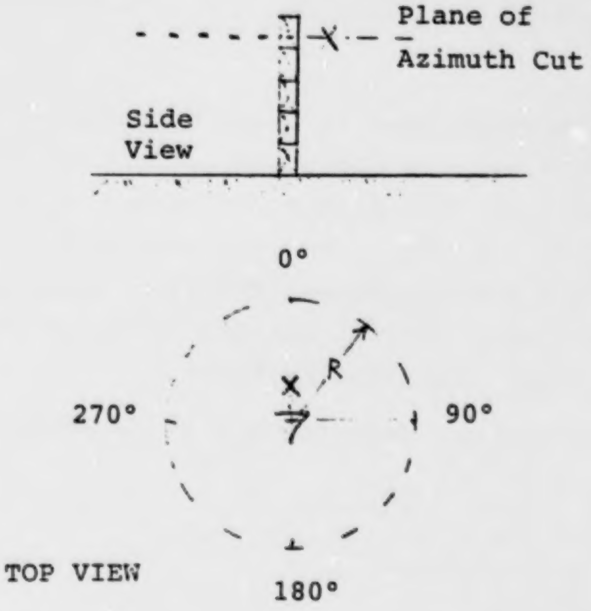

Plane of Azimuth Cut
Side View
0°
R
270°
90°
TOP VIEW
180°

Figure 8

DEFINITION OF AZIMUTH CUT

Elevation Cut

A sketch of a mounted antenna appears in Figure 9. The plan view shows the planes of the principal elevation cuts used in this study. The path of the measurement antenna for elevation cuts lies on a circle of constant radius, R, from the center of the tower at the height of the antenna under test. The elevation cuts are seen to give the relative field strengths along four great circles (meridians) of a sphere of radius R. The great circles have an equiangular spacing of 45 azimuthal degrees.

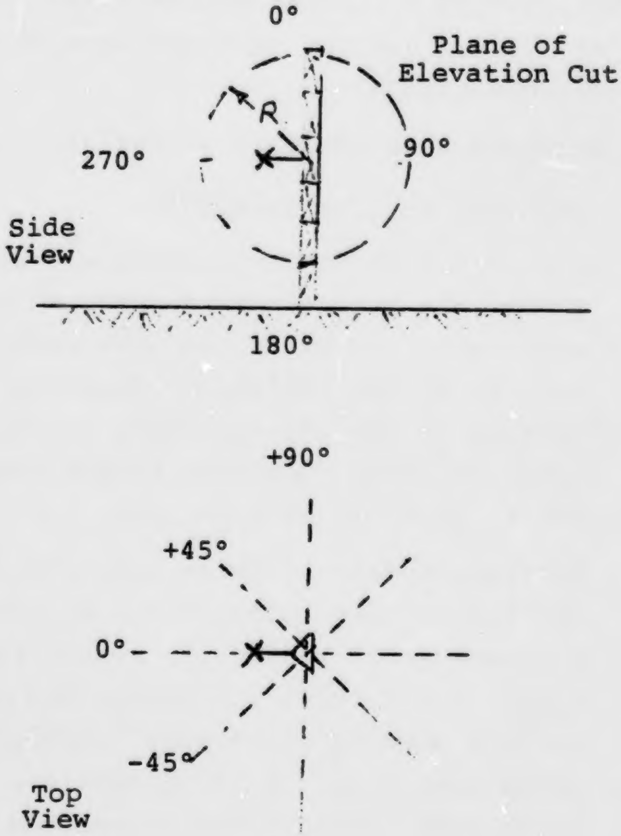

0°
Plane of Elevation Cut
R
270°
90°
Side View
180°
+90°
+45°
0°
-45°
Top View

Figure 9

DEFINITION OF ELEVATION CUT

## Considerations in Measurement

The antennas to be measured are all commercially produced and, therefore, represent 80% to 90% of antennas presently in use at FM stations. If the data to be produced as a result of this contract is to be useful in studying power density levels, then the measurement procedure must produce "typically representative" patterns of each type.

In addition, it should also be mentioned that, although it is inevitable that comparisons will be made between antennas of different manufacture, it was not required and is not desired that the data to be used for performance comparisons.

All antennas were measured in the same manner.

### (1) Parallax and Tower Effects

All of the antennas measured are side-mounted, hence, the tower-antenna combination must be considered. That is, to some extent the tower is part of the radiating structure. Also because of the side-mounting and the axis of rotation being about the center line of the tower, parallax is a problem.

A "representative" triangular tower with 24" leg spacing was selected for mounting the element. A knowledgable person may remark that "representative" used in this way means only that the tower section used is not vastly different from a large number of towers in service, but does not imply that the patterns themselves are representative of those achieved using the same antennas on somewhat different structures. To determine the effect of the tower on the respective element, "Free Space" patterns were measured. The metal tower was replaced with a "reflectionless" fiberglass pole.

Because the center line of the tower was used as the axis of rotation with the antenna rotated about this axis, it was necessary to provide some means of reference calibration of the range.

A Standard Dipole (S/A #29C-0.2) was used as a reference. Both E and H patterns were measured with the Standard Dipole oriented in both vertical and horizontal plane. These measurements were made with:

(a) The dipole at or very near the axis of rotation (≈4"). This represents the pattern of the element. The correlation with the theoretical pattern was very good.

(b) The dipole at a distance of 50" from the axis of rotation represents the average position of the measured antennas when they were mounted on the tower (but with no tower effect, only multipath range effects). The deviation from the theoretical is a measure of the error.

(c) The dipole mounted on the representative tower "leg" an average distance (54½ in.) from the tower.

(d) The dipole mounted on the representative tower "face" an average distance (47") from the tower.

A sketch of the orientation of the Standard Dipole is shown in Figure 10.

(2) Mounting Pecularities and Feed Structures

It should be recognized that each manufacturer to guarantee the radiation pattern recommends the

## STANDARD DIPOLE ARRANGEMENT

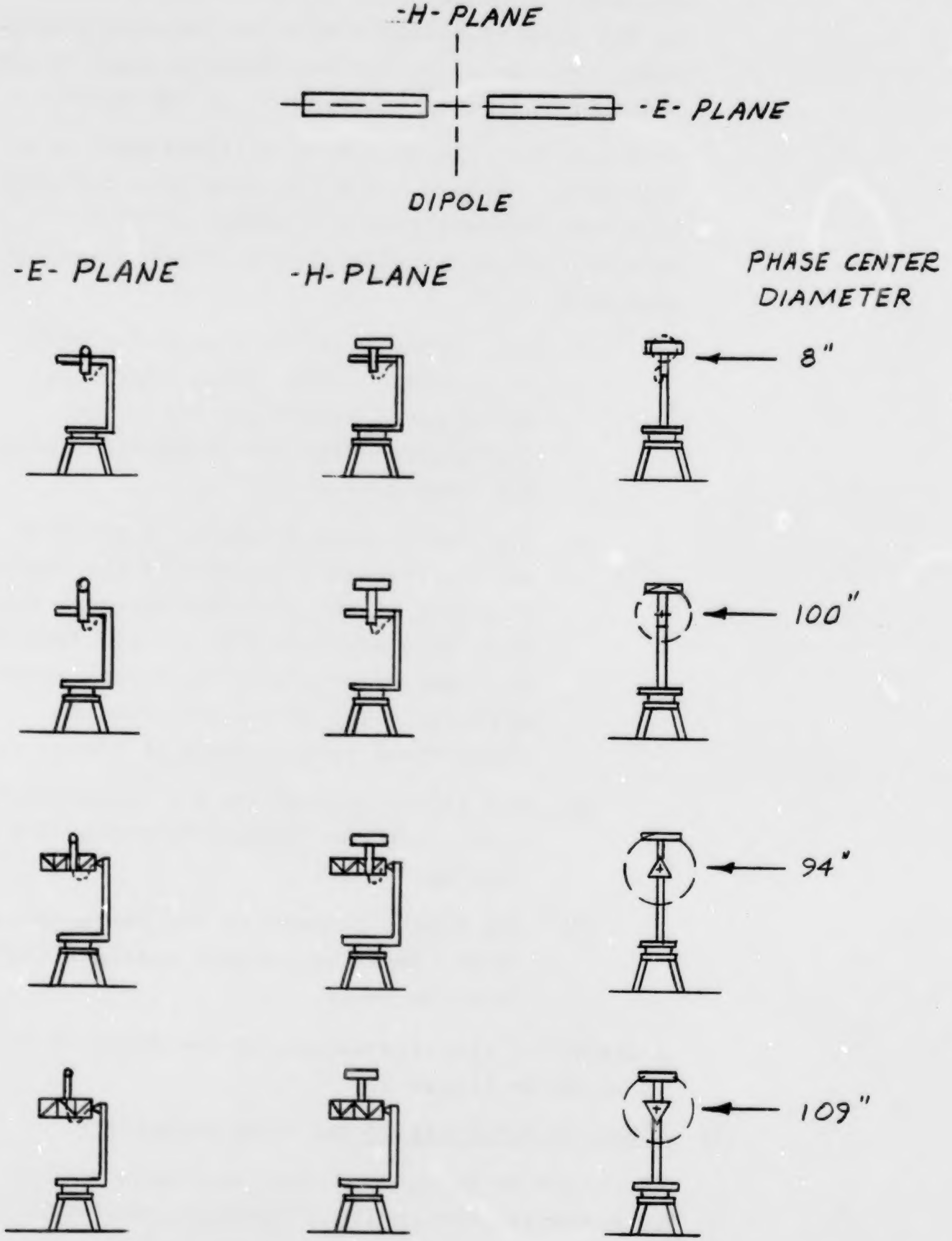
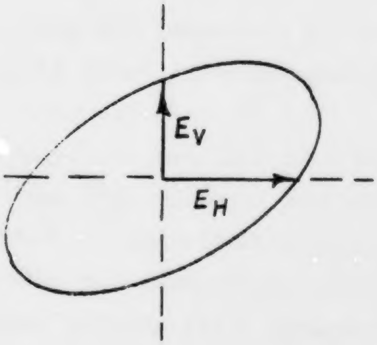

-H- PLANE
-E- PLANE
DIPOLE
-E- PLANE
-H- PLANE
PHASE CENTER DIAMETER
8"
100"
94"
109"

FIGURE - 10

antenna be mounted with supplied brackets a certain distance from the tower. The feed lines and mounting brackets are therefore part of the radiating structure, and the manufacturer has optimized his patterns in their presence. Hence, the "free space" patterns were made with these brackets on the antenna.

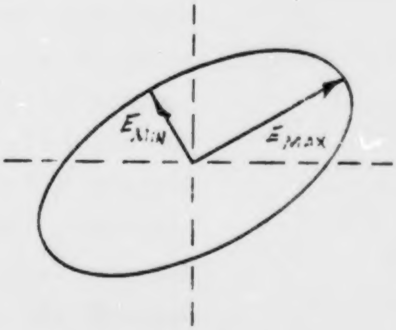
(3) Polarization

The FM antennas to be measured are nominally circularly polarized within the meaning of the FCC Rules and Regulations. In order to eliminate possible confusion it should be mentioned here that circular polarization in this context means the horizontal and vertical component of the radiated field are substantially identical (See FCC 73.310). This differs from the IEEE definition of axial ratio which is the ratio of the major to minor axis of the polarization ellipse regardless of its orientation



$$AR = \frac{E_V}{E_H}$$

FCC



$$AR = \frac{E_{MAX.}}{E_{MIN.}}$$

IEE

The axial ratio criteria was used to establish the range parameters. At the start of each new set of measurements the transmitting antenna height and range were adjusted until the reflected component adding in phase with the direct signal resulted in a minimum axial ratio. All subsequent measurements in that set were measured at that height.

(4) Range Geometry

The range geometry is shown in Figure 11.

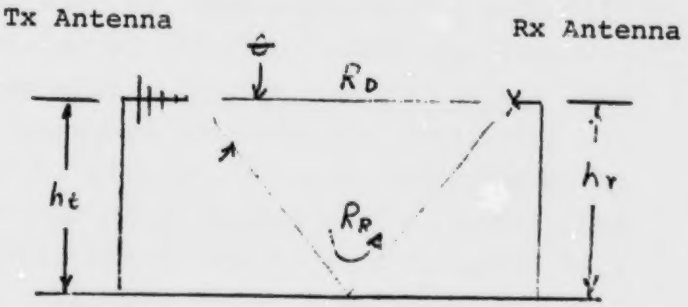


FIGURE 11
RANGE GEOMETRY

The signal arriving at the receiving antenna is composed of a direct wave and a reflected wave. The range distance is recorded on each plot. Most of the measurements were made at a range length of 131 ft. The electrical path difference between ($R_R$-$R_D$) varies for the different transmitter heights and was between 50° and 230° electrical degrees. This phase difference is further complicated by the fact that the amplitude and phase of the ground reflected signal will differ for vertical and horizontal polarization.

### (5) Multipath Effect

The amplitude and phase of the ground reflected signal for both horizontal and vertical polarization is listed in Table I for ground properties $\varepsilon = 15$, $\sigma = 5 \times 10^{-3}$ mmho/M at a frequency of 100 MHz.

| Incident Angle $\theta$ | Hoz. Polarization | | Vert. Polarization | |
|---|---|---|---|---|
| | $R_H$ | $\phi_H$ | $R_V$ | $\phi_V$ |
| 20 | .82 | 181° | .18 | 10° |
| 25 | .80 | 181° | .26 | 9° |
| 30 | .76 | 182° | .35 | 7° |
| 35 | .74 | 182° | .40 | 5° |

TABLE I

AMPLITUDE AND PHASE OF REFLECTED WAVE

The measurements are further complicated by the variation in test antenna height called the phase ring radius when azimuth patterns were measured.

The variation due to the ground reflected signal was mostly eliminated by using a scattering fence at the point of reflection (Figure 12).

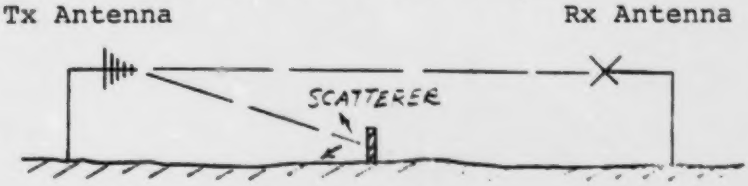


FIGURE 12

It can be seen with reference to the Standard Dipole patterns that the multipath effect was typically ±3 dB.

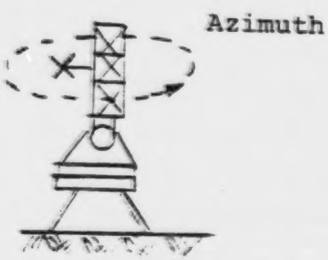
### (6) Measurement Coordinates

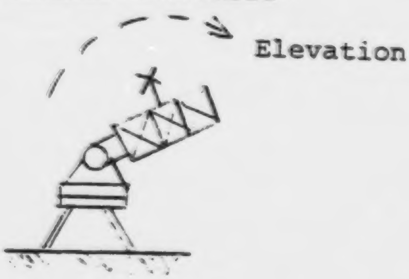
As previously mentioned, the ground reflected signal will have a significant effect on the measurements.

Although it can be reduced, it could not be totally eliminated.

It was decided to make the measurement in a non-conventional manner.

Normally, azimuth patterns would be taken by placing the antenna and tower on an azimuth turntable





and elevation patterns taken by tilting the tower in elevation. In this manner multipath errors would be minimal for the azimuth pattern, since hr (Figure 10) would be constant but the error would be great for elevation pattern since hr would be changing. Since the prime purpose of this program was to measure elevation pattern, it was decided to use the following geometry (Figure 13):

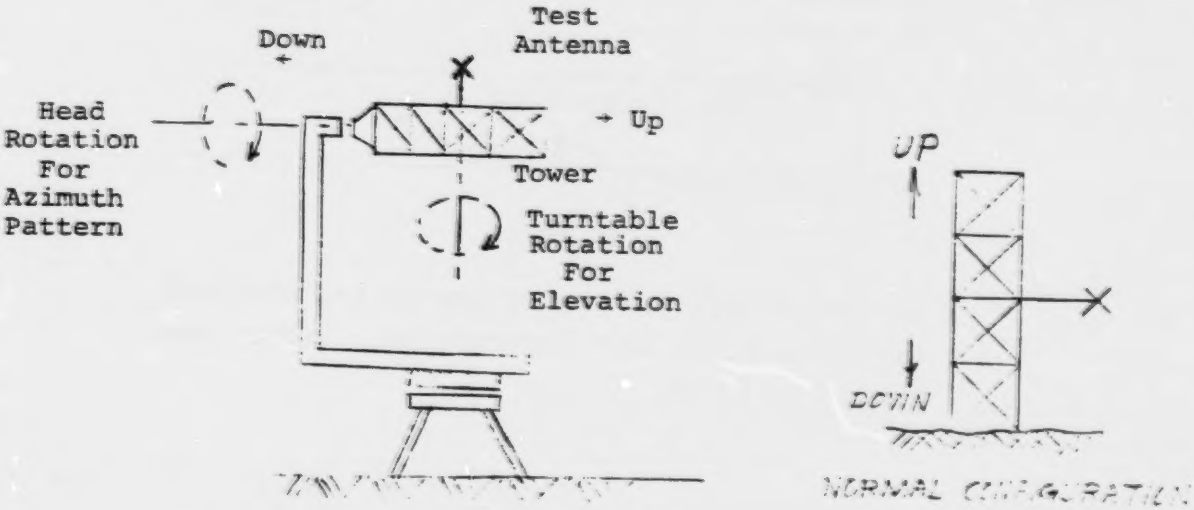

Down
Test Antenna
Head Rotation For Azimuth Pattern
Up
Tower
Turntable Rotation For Elevation
UP
DOWN
NORMAL CONFIGURATION

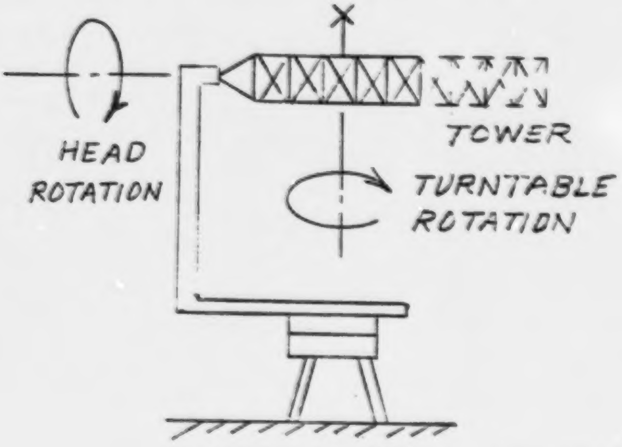
Figure 13

The antenna under test when making tower measurements was mounted over the rotational axis and in the center of the tower.

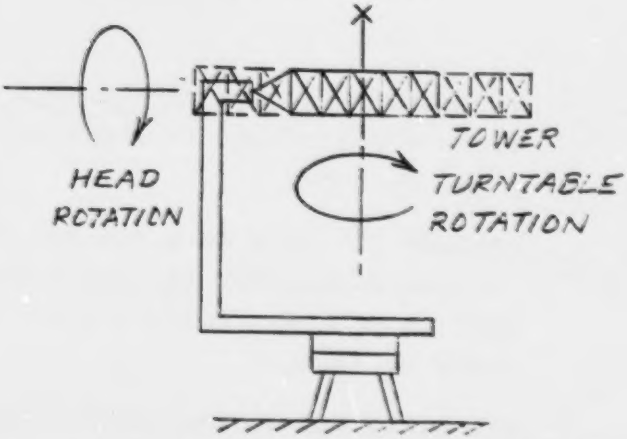
Measurements were made to determine the effect of the tower length. Three configurations were used:

(1) Basic tower (6 ft.)
(2) Tower with extender on base side (16 ft.)
(3) Tower with extender on both sides (26 ft.)

Rotational (azimuth) pattern could not be measured with configuration (3) because the extender went past the rotation head. All set measurements were taken with configuration (2).


HEAD
ROTATION
TOWER
TURNTABLE
ROTATION

TOWER EXTENDER - ONE SIDE
TOWER 16 Ft.


TOWER
HEAD
ROTATION
TURNTABLE
ROTATION

TOWER EXTENDER - BOTH SIDES
TOWER 26 Ft.

By rotating the turntable base we could then take 360° Great Circle elevation patterns. A further advantage is that when taking elevation patterns the antenna is fixed in height minimizing multipath errors.

The rotation of the head permitted us to quickly rotate the orientation of the antenna and take another Great Circle Cut.

Great Circle elevation patterns were taken through 360° with the antenna positioned, as follows:

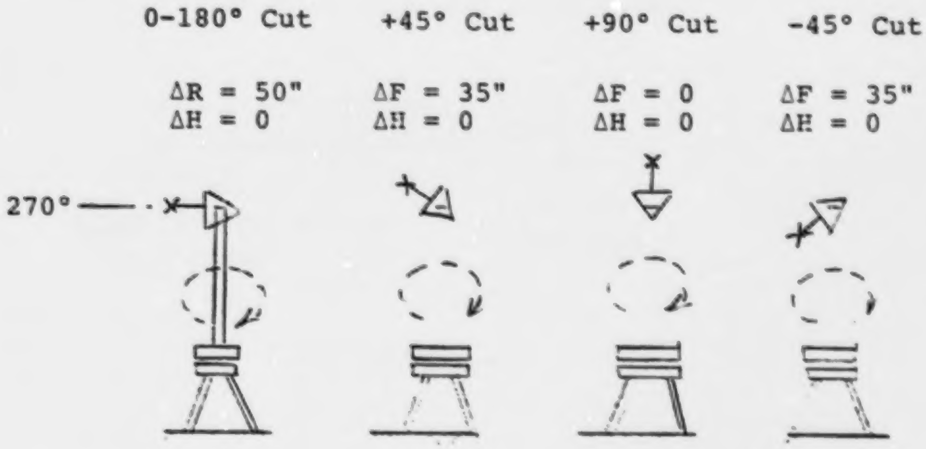


FIGURE 14

Elevation patterns were always started with the antenna positioned as shown and the recording paper at 270°.

Azimuth patterns were always started with the antenna facing the transmitting antenna and then rolling the head through 360° with the recording paper at zero.

The error due to the large diameter phase ring was greatest for the azimuth pattern, but those patterns were of secondary interest.

(7) Recording Paper Coordinates

To properly interpret the measured data, it is necessary to know the direction of the recording turntable rotation.

The recording paper is calibrated in degrees (clockwise) on the outer periphery of the paper, and the signal level R is in dB as shown in Figure 15.

The top and bottom of the tower would be at zero and 180° on the paper.

All elevation patterns were started at 270° on the paper.

All azimuth patterns were started at 0° on the paper (Figure 16).

The noise level, as shown in Figure 17, was down 25 dB. This is the signal recorded with the test transmitter turned off. The noise level of the receiver and recorder are also shown in Figure 17.

The standard dipole E-plane pattern has a cos (θ) function while the H-plane pattern is uniform. This is shown for reference purpose on Figures15 and 16.

(8) Axial Ratio Criteria

The range variables were spacings between transmitting and test antenna (R) as well as height of the transmitting ($H_1$).

The resultant patterns include the properties of the antenna being measured and multipath effects. Multipath effects could not be entirely removed. Preliminary measurements were made with scattering fences at the point of reflection. Experiments

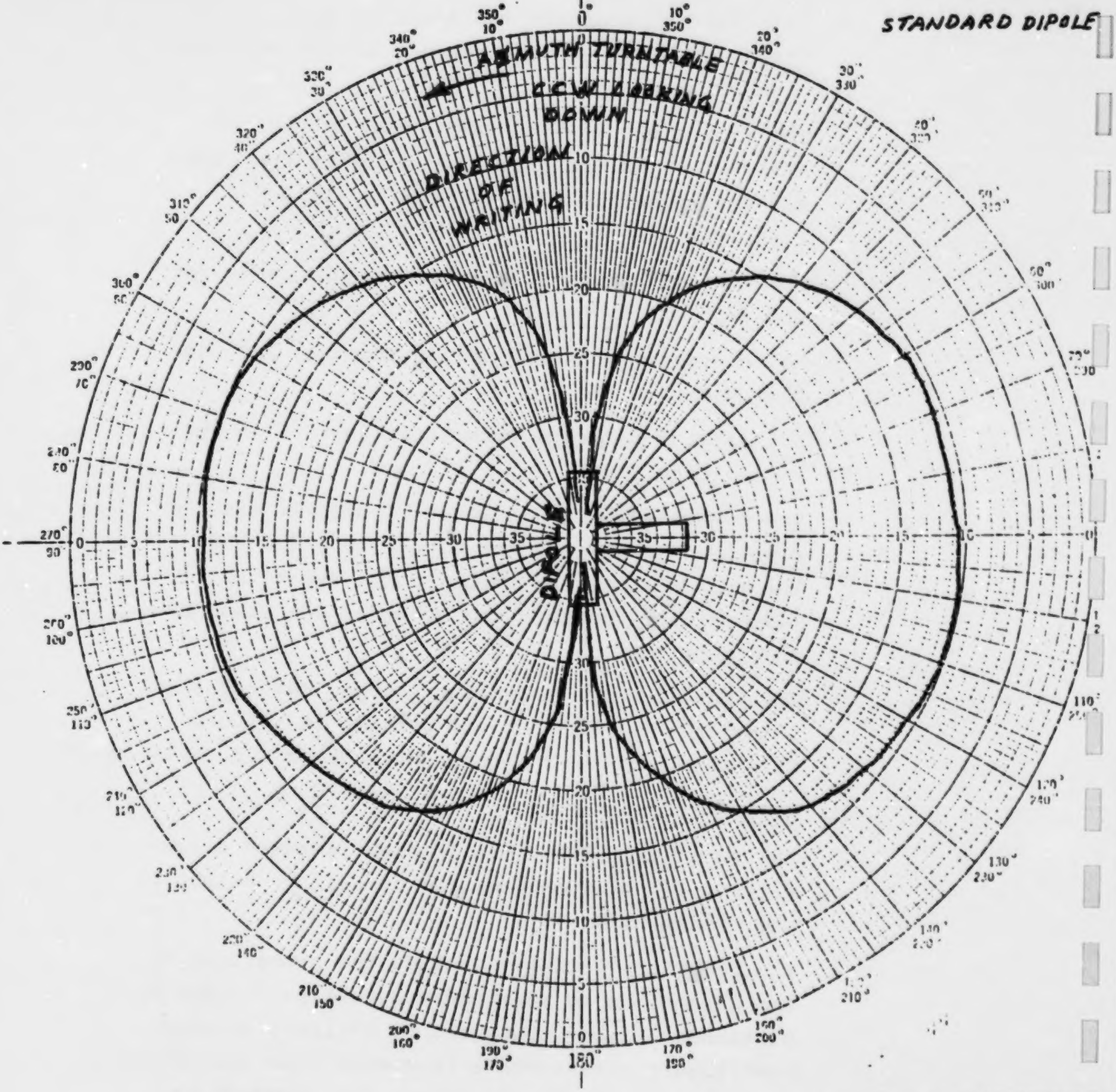
**Micro Communications Inc.**

DATE: ____________

MODEL: REFERENCE

PATTERN NO.: E - PLANE
COS ( θ )

STANDARD DIPOLE



PATTERN: ELEVATION

TOWER BOTTOM

ANTENNA LOCATION ON TOWER: ____________

FIGURE 15

TRANSMITTING ANTENNA POLARIZATION: ____________

HEIGHT OF TRANSMITTING ANTENNA: ____________

DIST. FROM TRANS. ANT. TO TEST ANT.: ____________

RING RADIUS: ____________

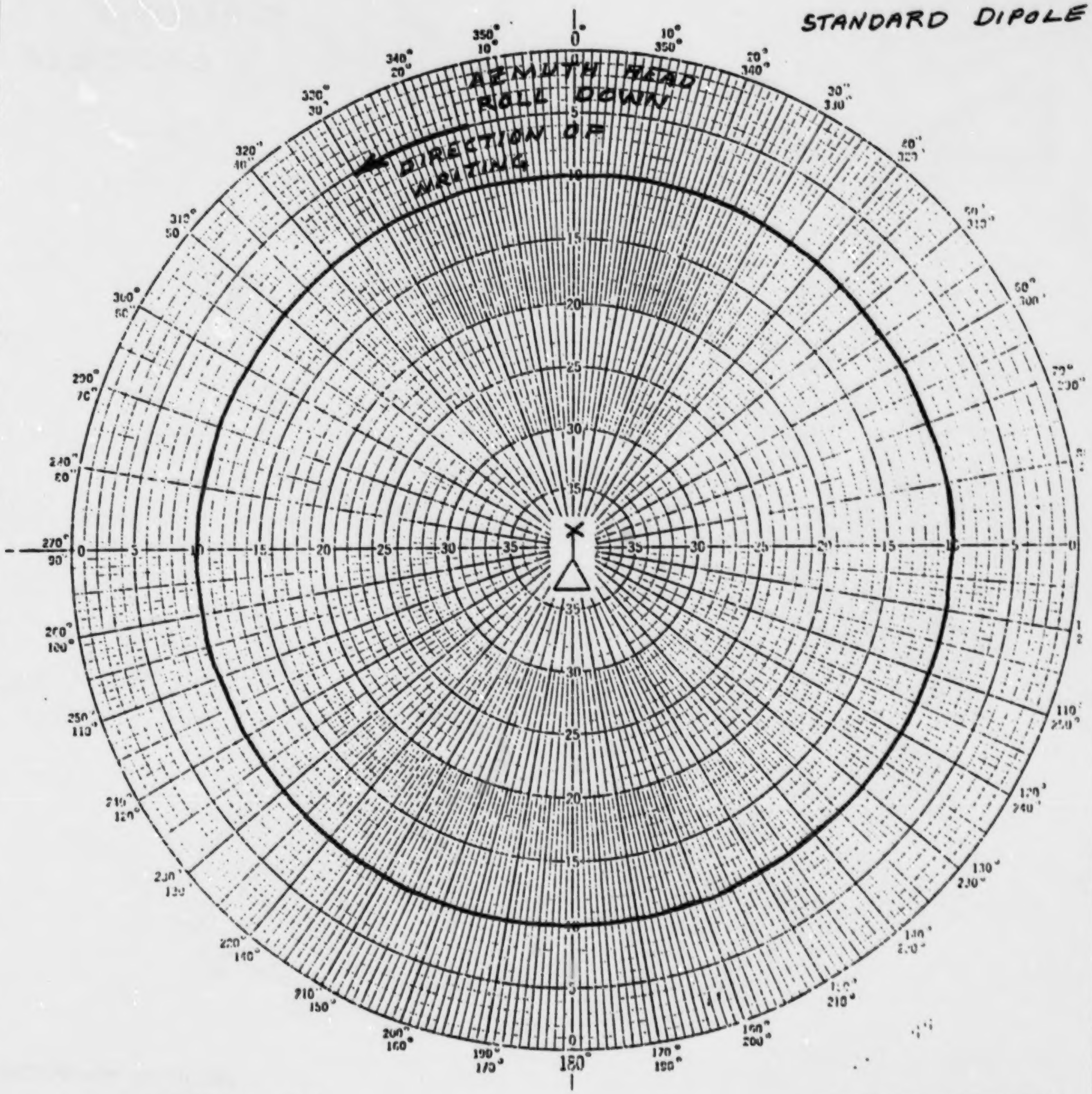
**Micro Communications Inc.**

DATE: ______________

MODEL: REFERENCE

PATTERN NO.: -H-PLANE

STANDARD DIPOLE



AZMUTH HEAD ROLL DOWN

DIRECTION OF WRITING

PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: ______________

TRANSMITTING ANTENNA
POLARIZATION: ________

FIGURE 16

HEIGHT OF TRANSMITTING
ANTENNA: ______________

DIST. FROM TRANS. ANT.
TO TEST ANT.: __________

RING RADIUS: __________

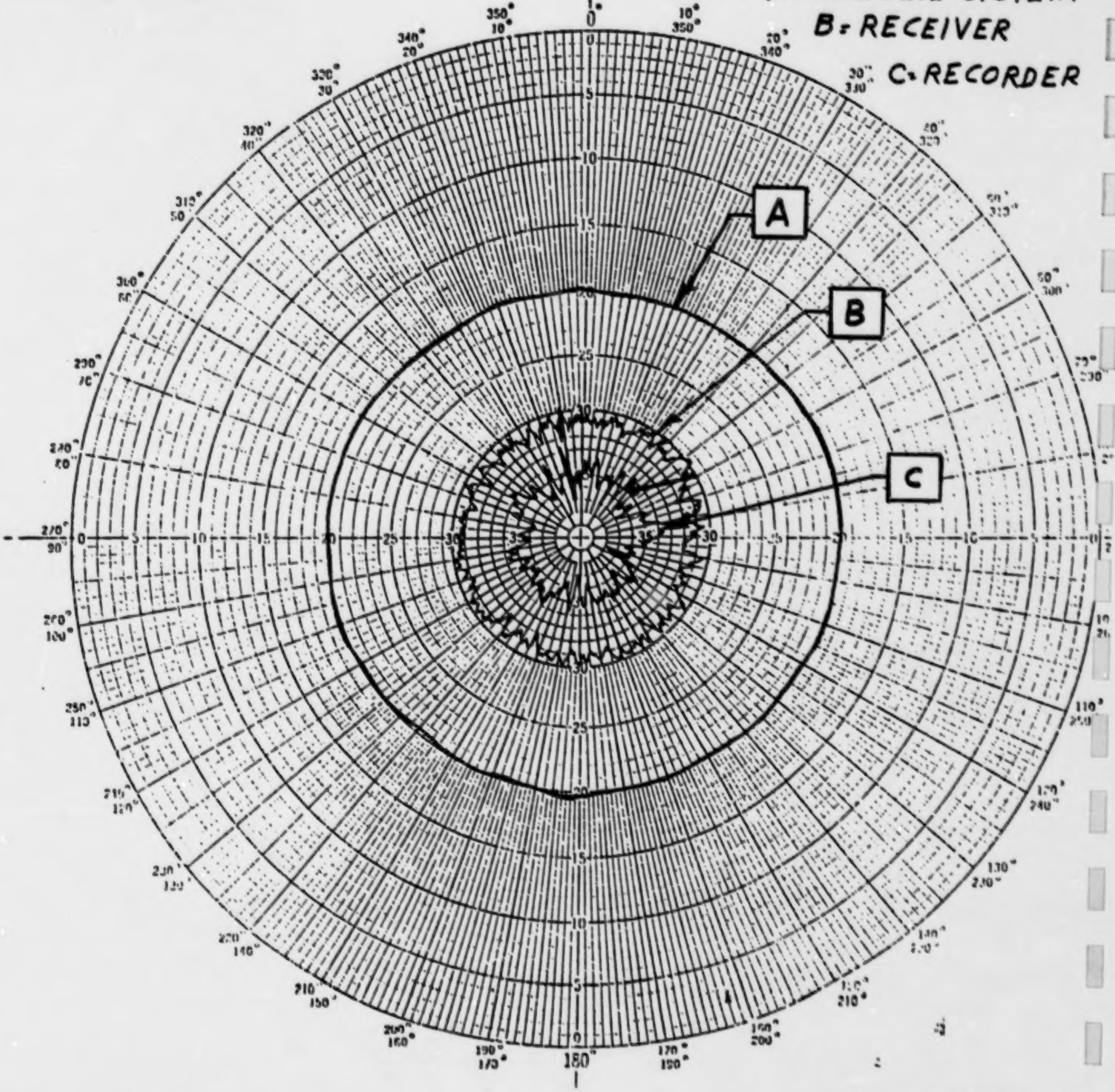
**Micro Communications Inc.**

DATE: ____________

MODEL: NOISE LEVEL

PATTERN NO.: ____________

A = COMPLETE SYSTEM
B = RECEIVER
C = RECORDER



PATTERN: ____________

ANTENNA LOCATION
ON TOWER: ____________

TRANSMITTING ANTENNA
POLARIZATION: ____________

FIGURE - 17

HEIGHT OF TRANSMITTING
ANTENNA: ____________

DIST. FROM TRANS. ANT.
TO TEST ANT.: ____________

RING RADIUS: ____________

were made with scatters 10 ft. and 20 ft. in width and heights of 6 to 12 ft. The larger scatter (20 ft. x 12 ft.) was used with all measurements.

It was decided to use the Axial Ratio criteria for (R) and $h_1$. This is defined, as follows:

All antennas measured were Circularly Polarized and the axial ratio as determined by each manufacturer was very good. It was therefore decided at the start of each test to adjust the range variables until the best axial ratio was obtained. Since the transmitting antenna was remotely rotatable about its own axis, this was easy to do.

(9) Test Sequence

Each antenna was tested for three positions (Figure 18).

(a) Free Space. Antenna was mounted to a Fiberglas mount. Any backbone, or extensions recommended by the manufacturer as being part of the basic element, were included.

(b) Leg Mounted. Antenna mounted on the leg of the representative standard tower at a distance from the tower (using hardware supplied) recommended by the manufacturer.

(c) Face Mounted. Antenna mounted on the face of the tower using same hardware.

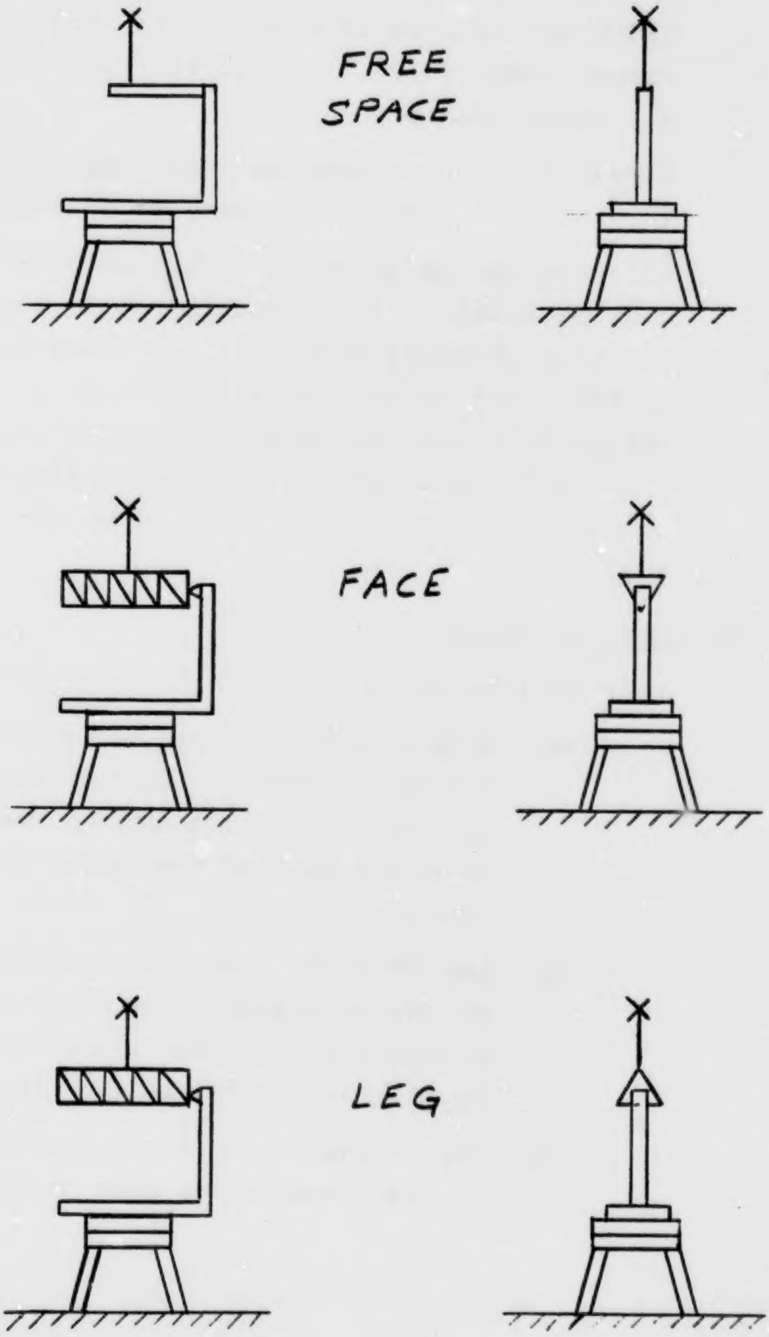

FREE SPACE
FACE
LEG

FIGURE 18

The patterns taken after optimizing the axial ratio on each set were:

(a) Axial Ratio.

(b) Azimuth Pattern with the transmitting antenna (1) vertically polarized and (2) horizontally polarized.

(c) Elevation Pattern through a Great Circle, cuts of 0-180°, +45°, +90°, and -45° with the transmitting antenna (1) vertically polarized and (2) horizontally polarized.

The range was calibrated using the standard dipole. This data is included in Section VI. This section also includes the experimental data used to establish the range parameters.

## IV. PATTERN MEASUREMENT

### (A) MODEL "A": FREE SPACE, FACE AND LEG MEASUREMENTS

AZIMUTH, HORIZONTALLY POLARIZED
AZIMUTH, VERTICALLY POLARIZED
ELEVATION, HORIZONTALLY POLARIZED
ELEVATION, VERTICALLY POLARIZED

### (B) MODEL "B": FREE SPACE, FACE AND LEG MEASUREMENTS

AZIMUTH, HORIZONTALLY POLARIZED
AZIMUTH, VERTICALLY POLARIZED
ELEVATION, HORIZONTALLY POLARIZED
ELEVATION, VERTICALLY POLARIZED

### (C) MODEL "C": FREE SPACE, FACE AND LEG MEASUREMENTS

AZIMUTH, HORIZONTALLY POLARIZED
AZIMUTH, VERTICALLY POLARIZED
ELEVATION, HORIZONTALLY POLARIZED
ELEVATION, VERTICALLY POLARIZED

### (D) MODEL "D": FREE SPACE, FACE AND LEG MEASUREMENTS

AZIMUTH, HORIZONTALLY POLARIZED
AZIMUTH, VERTICALLY POLARIZED
ELEVATION, HORIZONTALLY POLARIZED
ELEVATION, VERTICALLY POLARIZED

### (E) MODEL "E": FREE SPACE, FACE AND LEG MEASUREMENTS

AZIMUTH, HORIZONTALLY POLARIZED
AZIMUTH, VERTICALLY POLARIZED
ELEVATION, HORIZONTALLY POLARIZED
ELEVATION, VERTICALLY POLARIZED

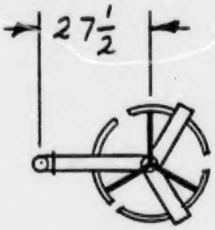
### (F) MODEL "F": FREE SPACE, FACE AND LEG MEASUREMENTS

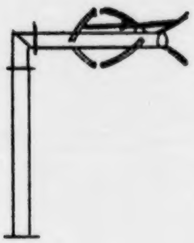
H-PLANE, HORIZONTALLY POLARIZED
H-PLANE, VERTICALLY POLARIZED
E-PLANE, HORIZONTALLY POLARIZED
E-PLANE, VERTICALLY POLARIZED

## MODEL "A"
## FREE SPACE MEASUREMENTS
July 31, 1981

| PATTERN NUMBER | * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLARIZATION | REMARKS |
|---|---|---|---|---|---|
| AFS1 | (32) | 18.5 | Axial Ratio | | |
| AFS2 | (33) | 18.5 | Azimuth | Hoz. | |
| AFS3 | (34) | 18.5 | Azimuth | Vert. | |
| AFS4 | (35) | 18.5 | Elevation | Hoz. | 0-180 cut |
| AFS5 | (36) | 18.5 | Elevation | Vert. | 0-180 cut |
| AFS6 | (37) | 18.5 | Elevation | Hoz. | +45 cut |
| AFS7 | (38) | 18.5 | Elevation | Vert. | +45 cut |
| AFS8 | (39) | 18.5 | Elevation | Hoz. | +90 cut |
| AFS9 | (40) | 18.5 | Elevation | Vert. | +90 cut |
| AFS10 | (41) | 18.5 | Elevation | Hoz. | -45 cut |
| AFS11 | (42) | 18.5 | Elevation | Vert. | -45 cut |

*Page Numbers



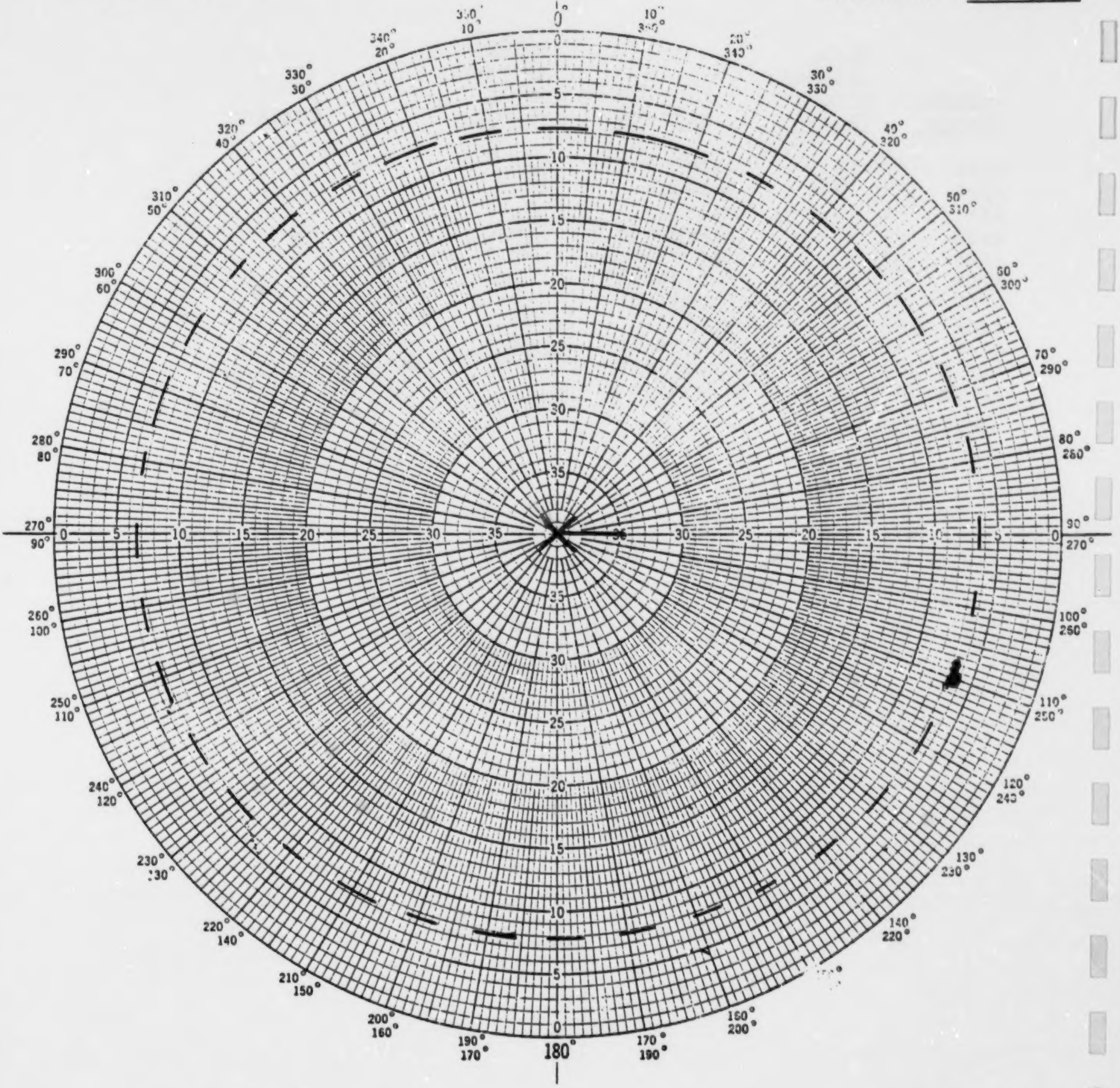


**Micro Communications Inc.**

DATE: 7/31/81

MODEL: A

PATTERN NO.: AFS1



PATTERN: AXIAL RATIO

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: ______

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

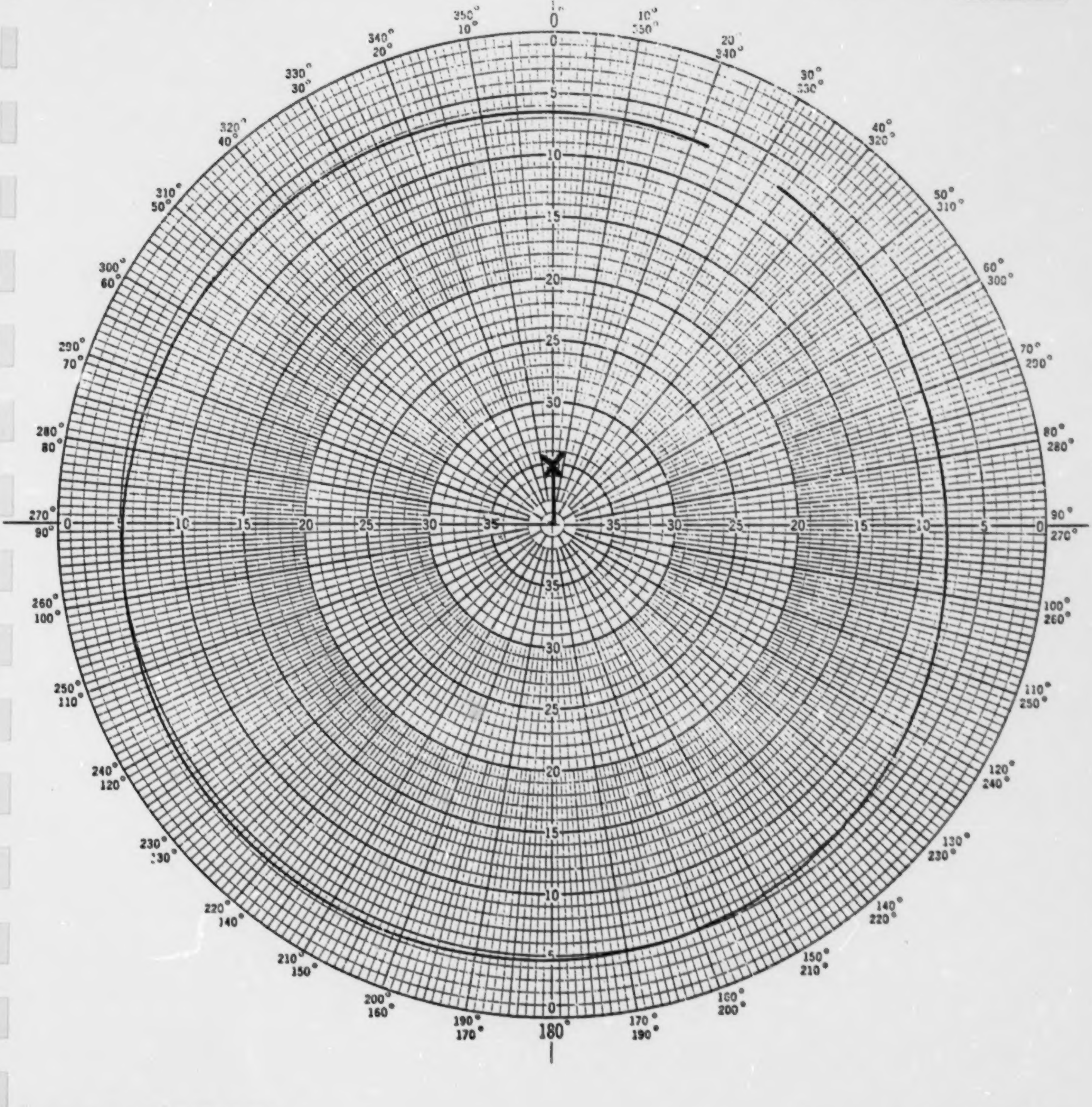
RING RADIUS: 27.5"

Micro
Communications
Inc.

DATE: 7/31/81

MODEL: A

PATTERN NO.: AFS2



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

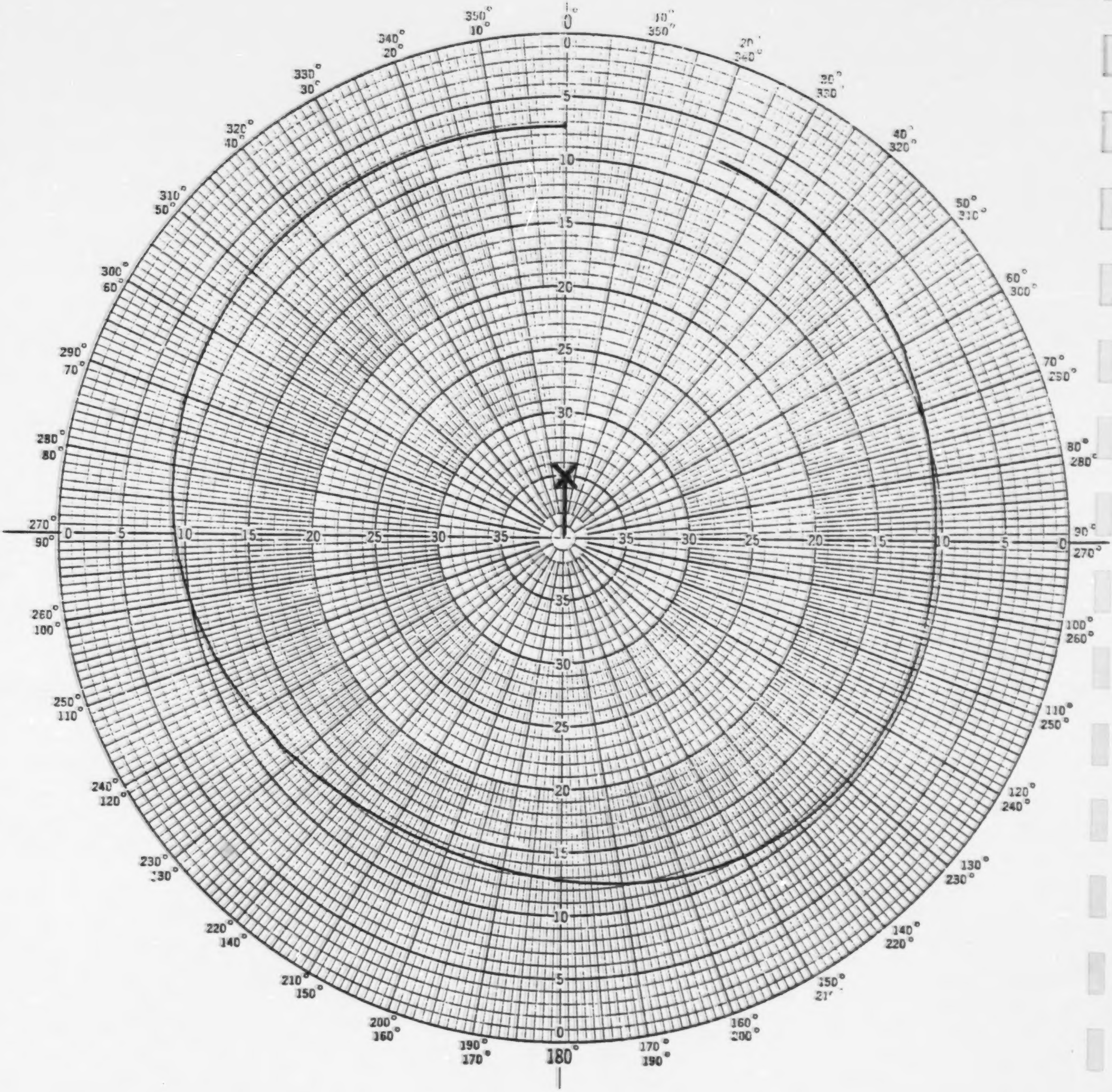
RING RADIUS: 27.5"

Micro
Communications
Inc.

DATE: 7/31/81

MODEL: A

PATTERN NO.: AFS3



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

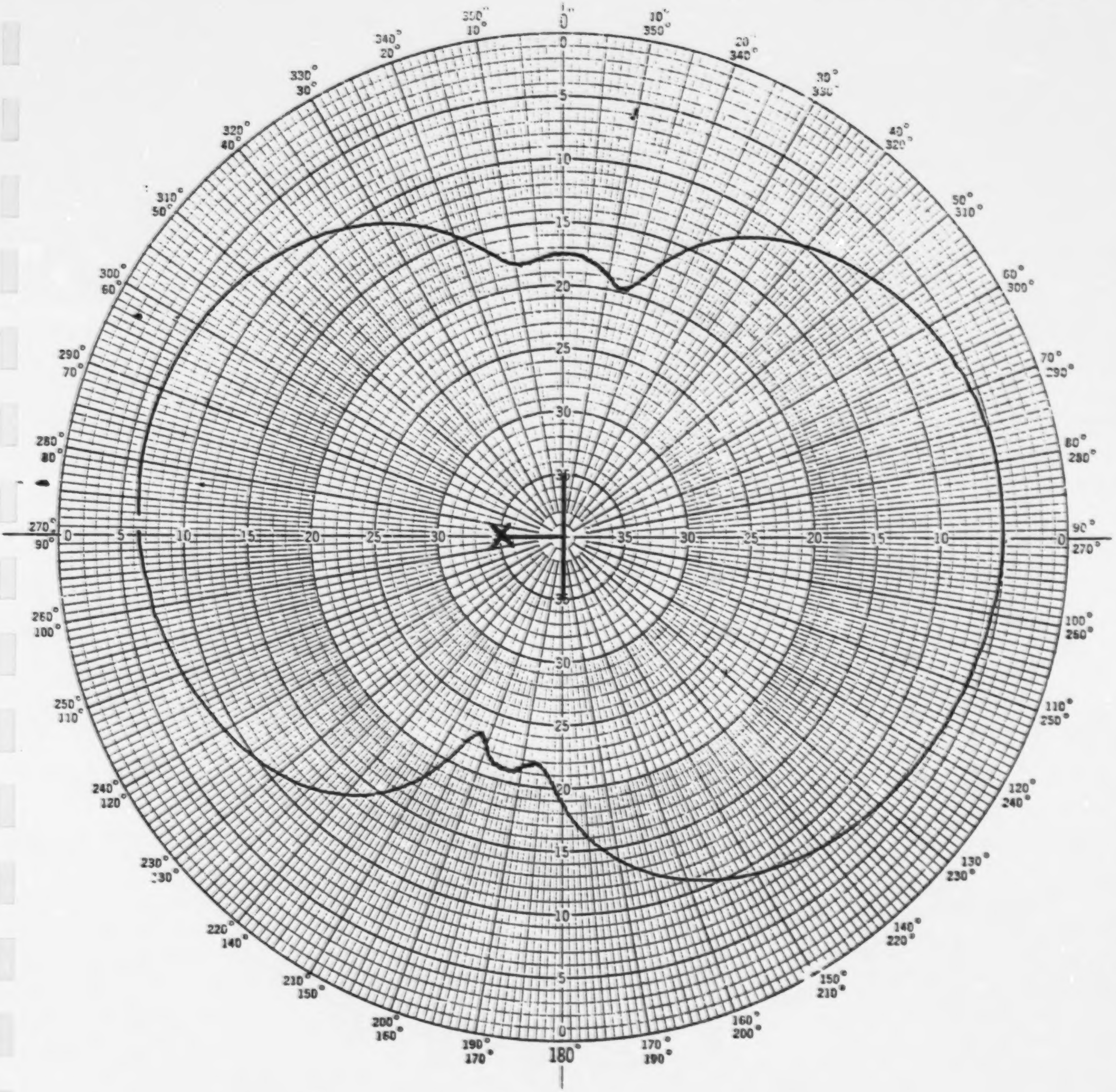
RING RADIUS: 27.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: A

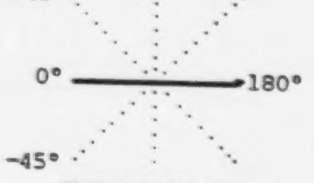
PATTERN NO.: AFS4



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

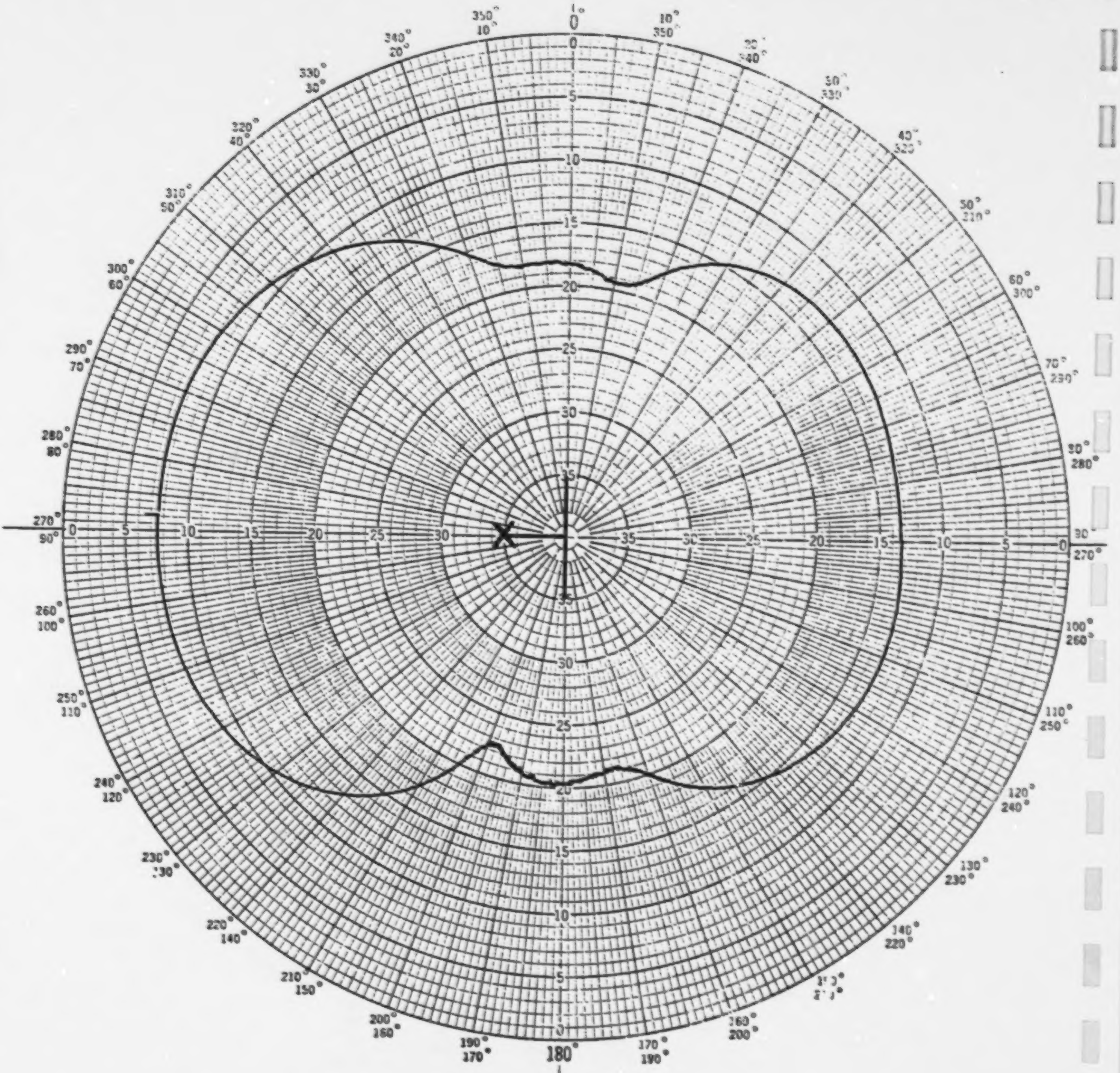
RING RADIUS: 27.5"

MCi **Micro Communications Inc.**

DATE: 7/31/81

MODEL: A

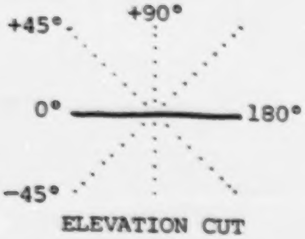
PATTERN NO.: AFS5



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

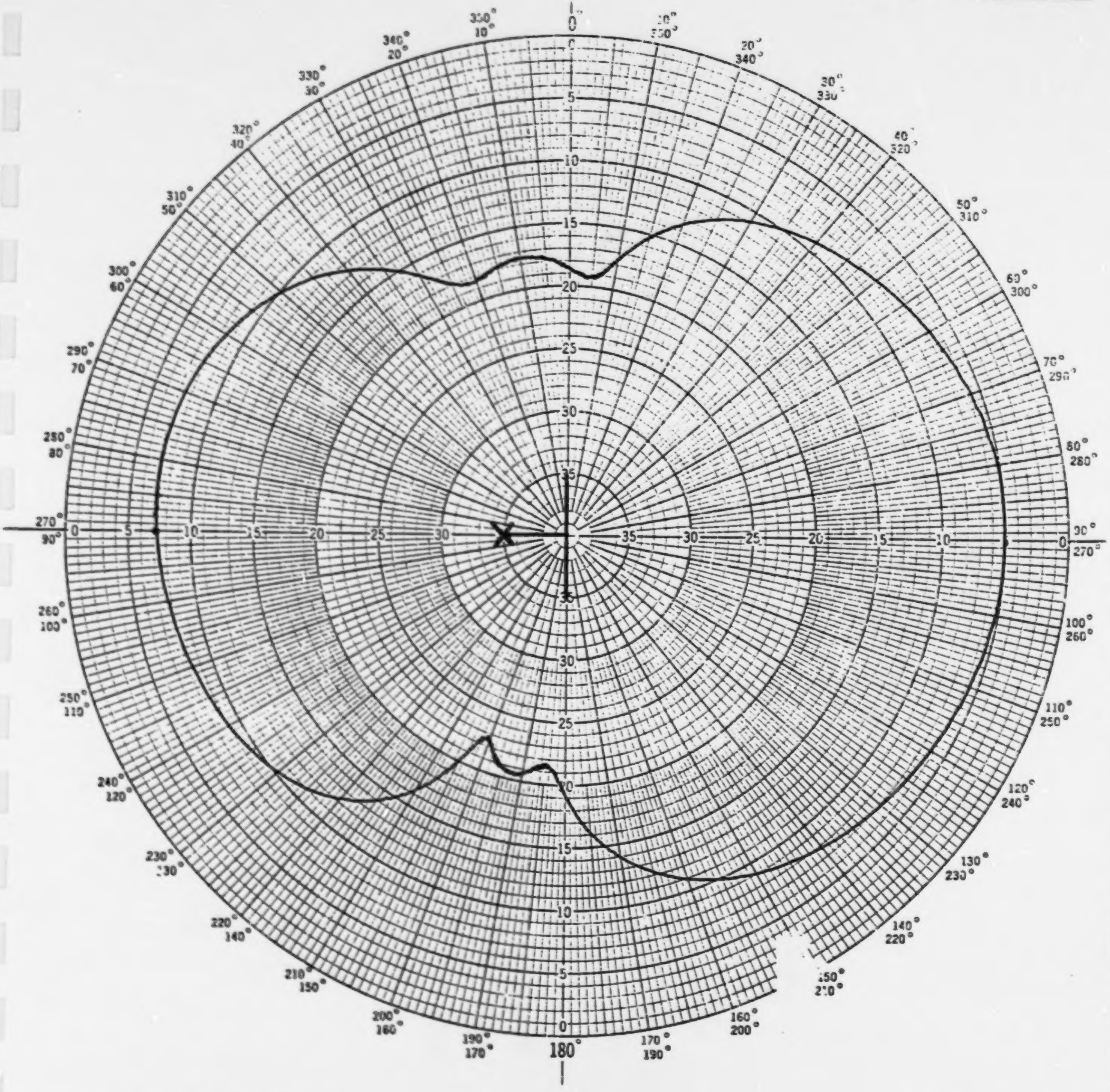
RING RADIUS: 27.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: A

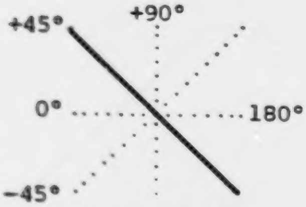
PATTERN NO.: AFS6



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

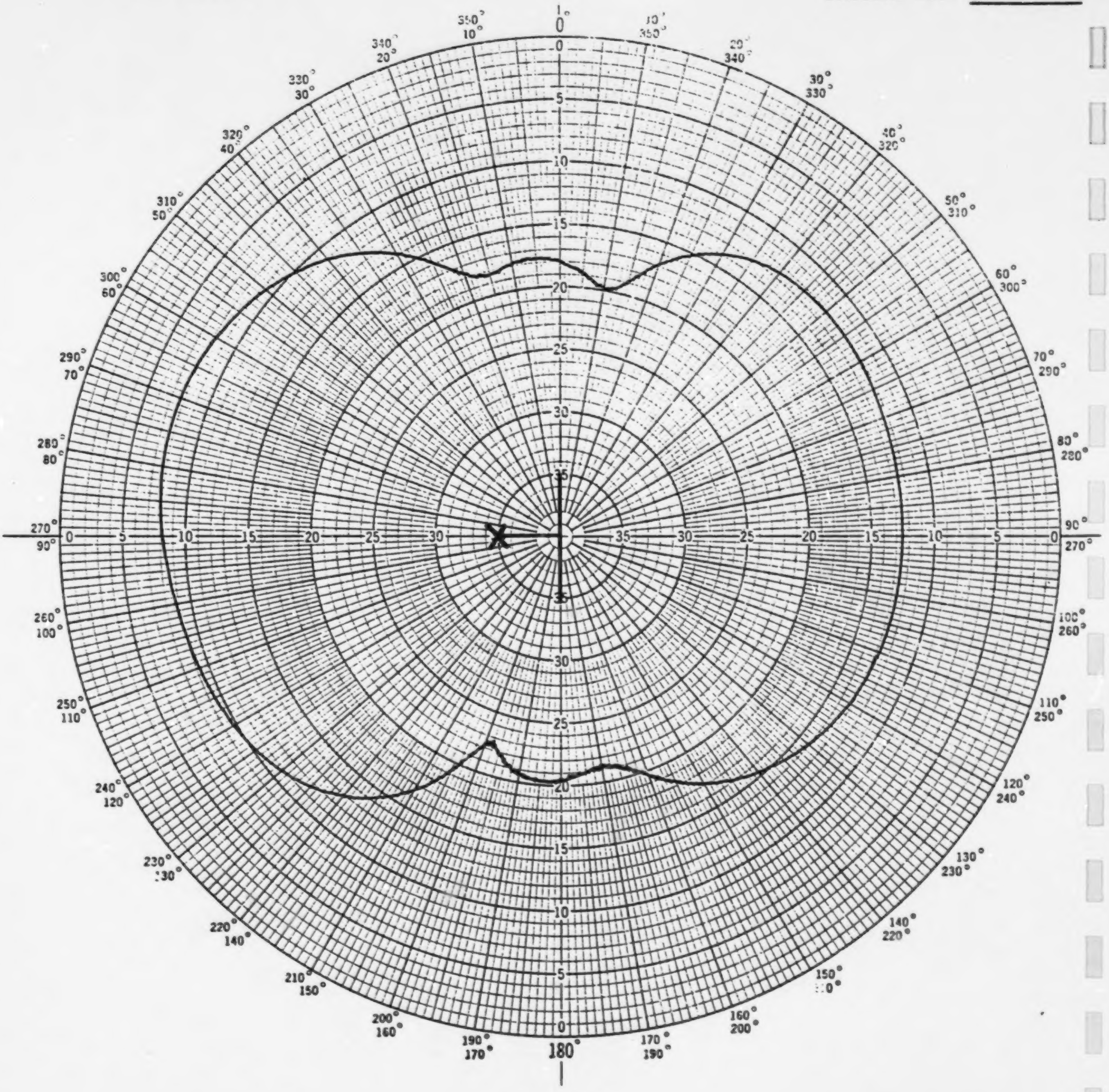
RING RADIUS: 27.5"

**Micro Communications Inc.**

DATE: 7/31/61

MODEL: A

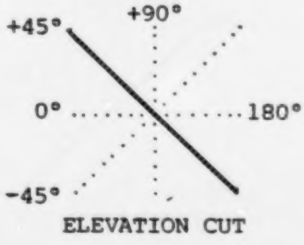
PATTERN NO.: AF57



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

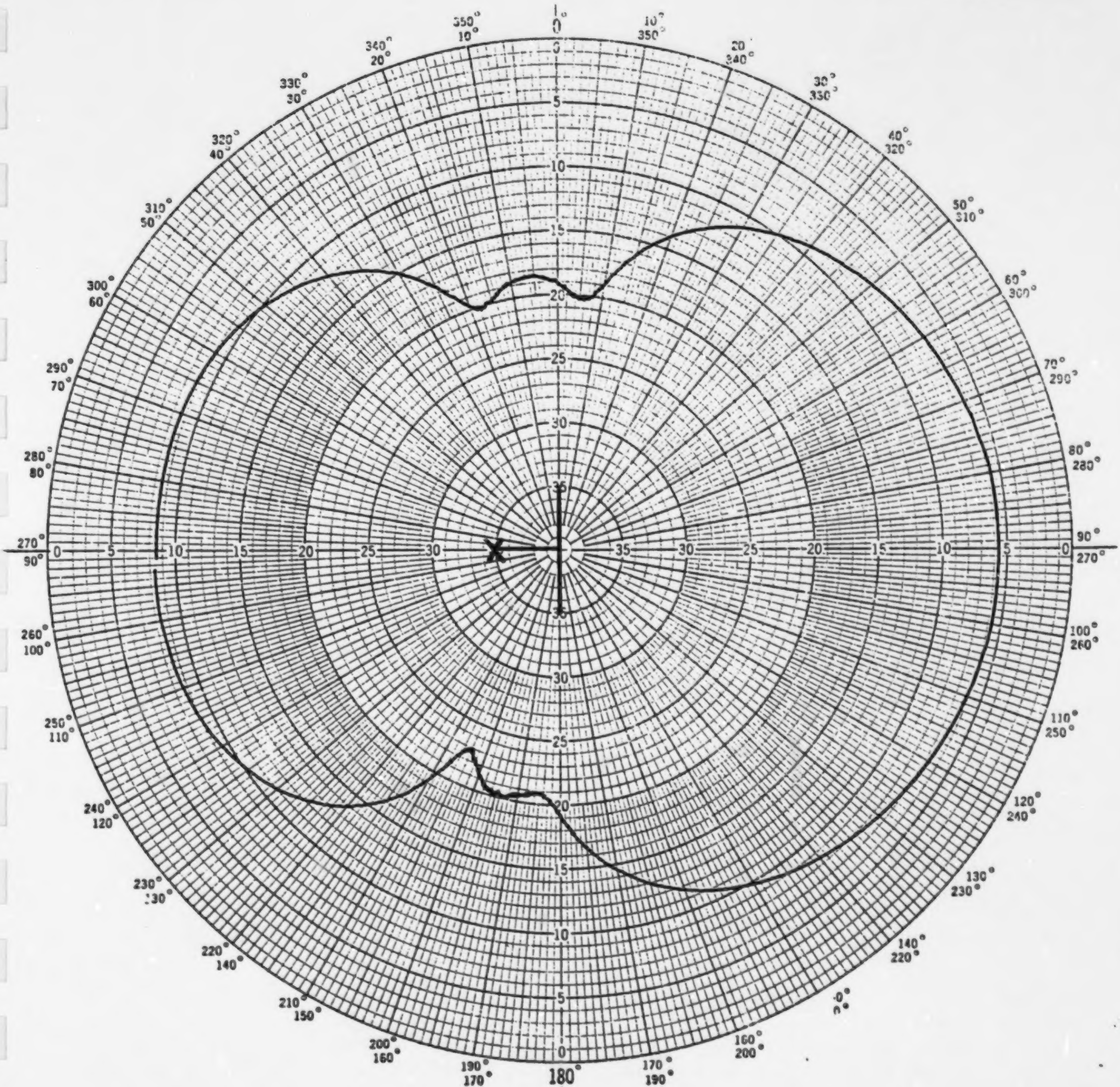
RING RADIUS: 27.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: A

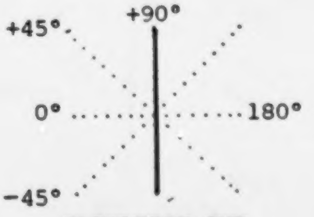
PATTERN NO.: AFS8



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FREE SPACE

TRANSMITTING ANTENNA POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

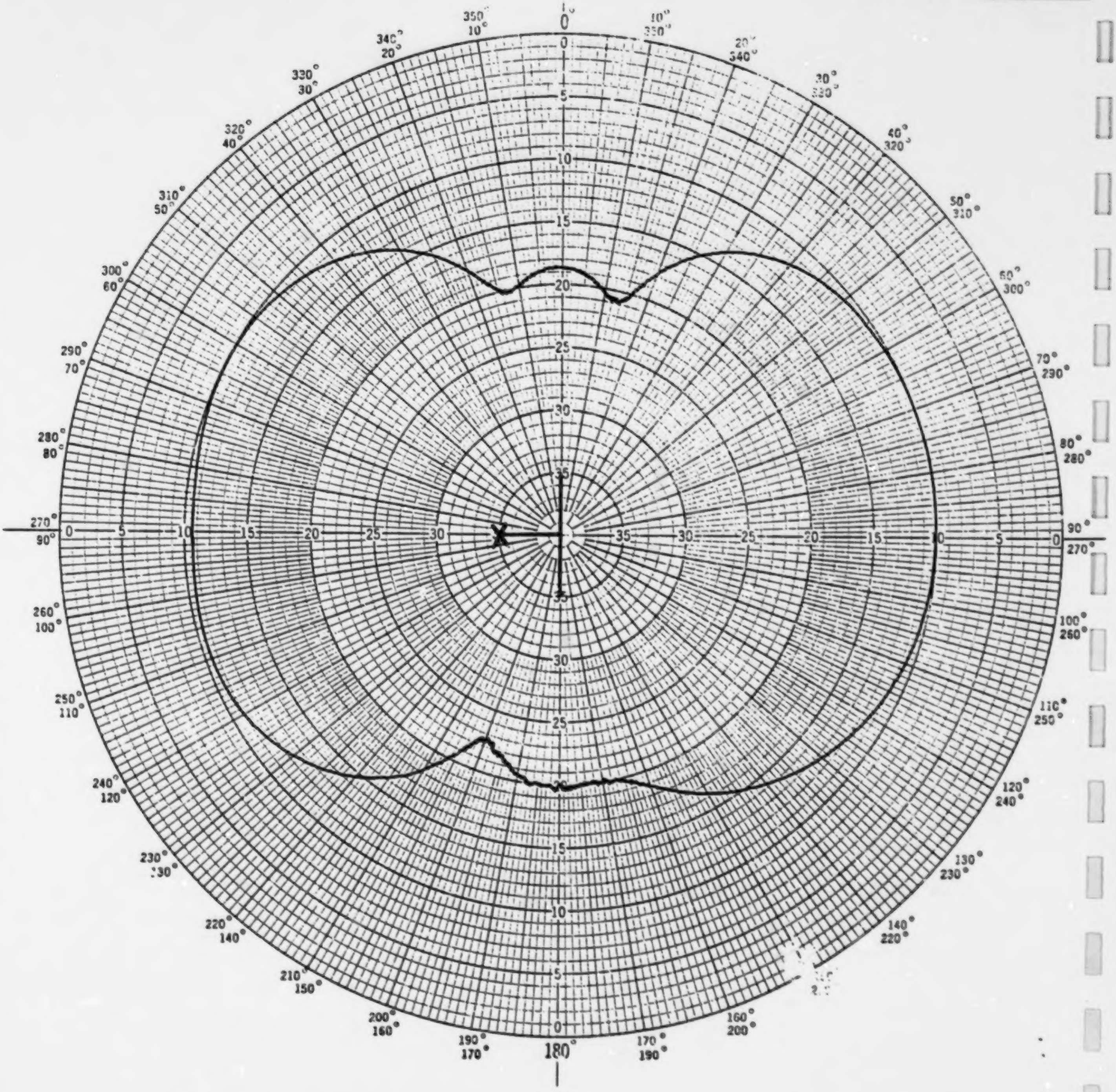
RING RADIUS: 27.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: A

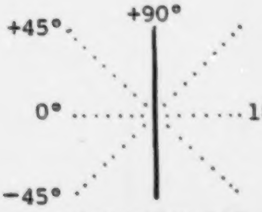
PATTERN NO.: AFS9



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FREE SPACE

TRANSMITTING ANTENNA POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

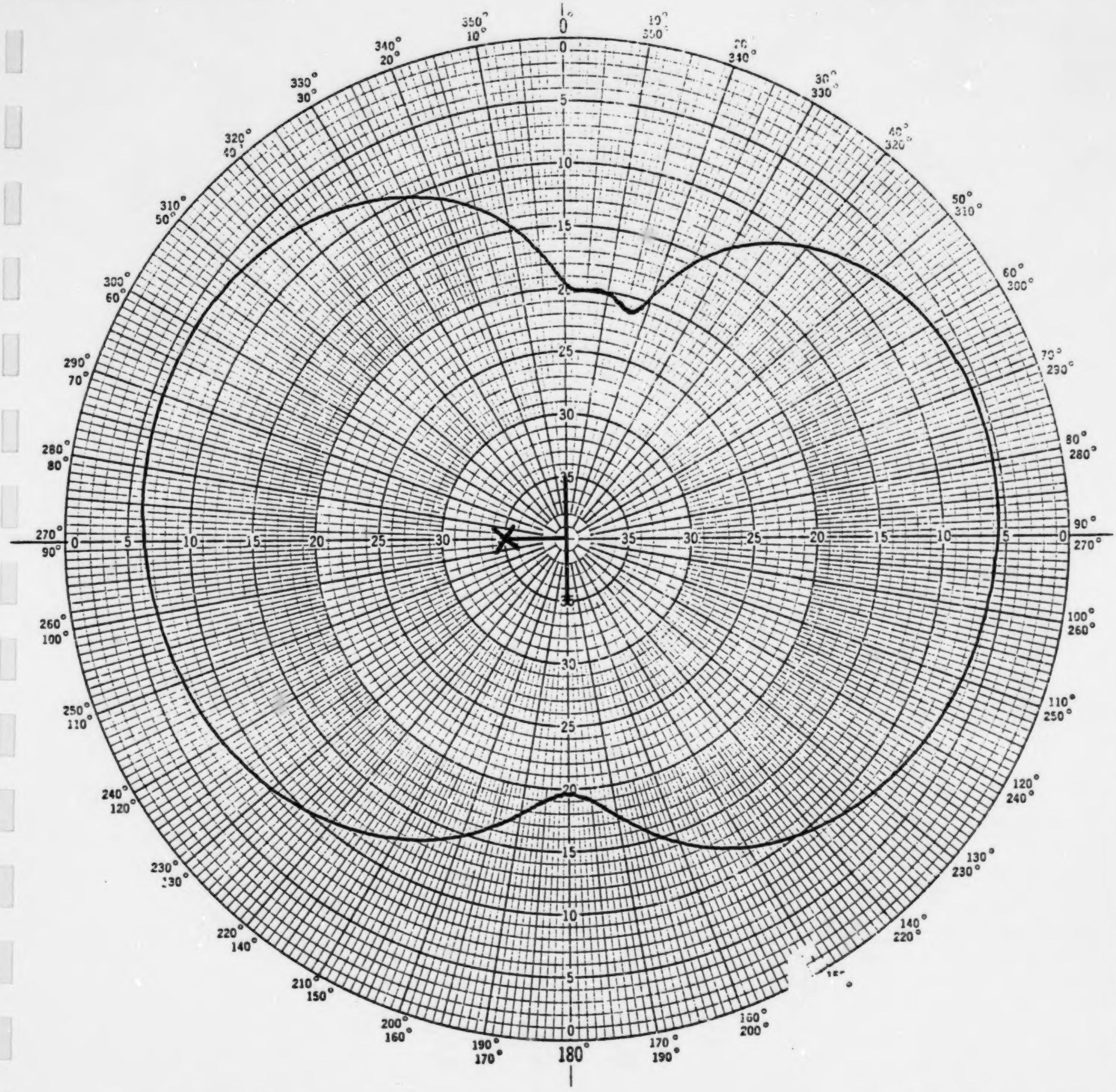
RING RADIUS: 27.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: A

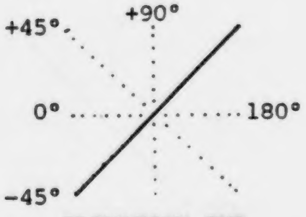
PATTERN NO.: AFS10



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

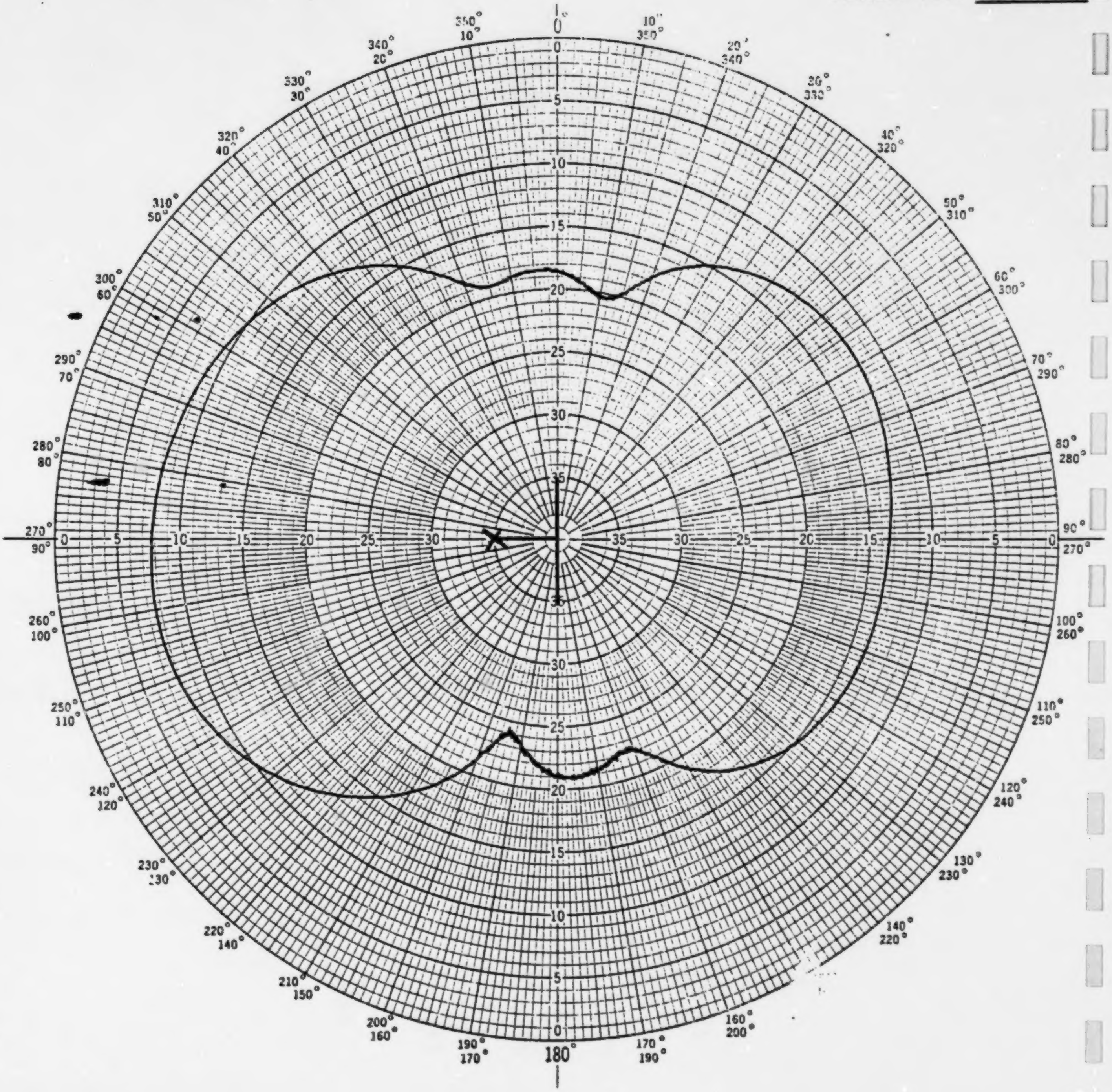
RING RADIUS: 27.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: A

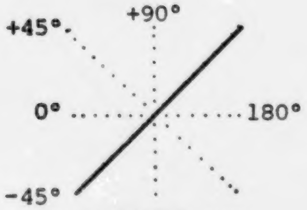
PATTERN NO.: AFS11



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

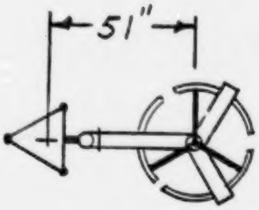
RING RADIUS: 27.5"

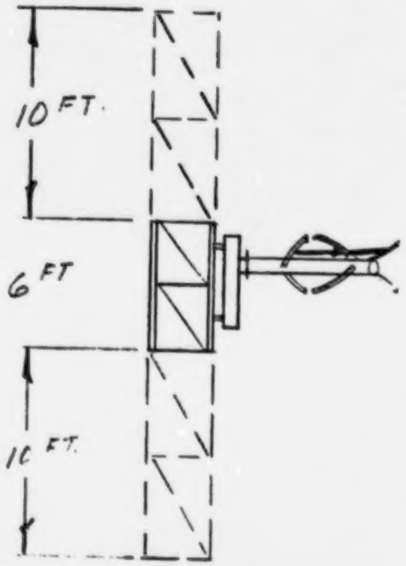
MODEL "A"
ANTENNA MOUNTED
ON TOWER FACE
August 3, 1981

| PATTERN NUMBER * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLARIZATION | REMARKS |
|---|---|---|---|---|
| AF1 (44) | 16.5 | Axial Ratio | | |
| AF2 (45) | 19.5 | Axial Ratio | | |
| AF3 (46) | 19.5 | Azimuth | Hoz. | |
| AF4 (47) | 19.5 | Azimuth | Vert. | |
| AF5 (48) | 19.5 | Elevation | Hoz. | 0-180 cut |
| AF6 (49) | 19.5 | Elevation | Vert. | 0-180 cut |
| AF7 (50) | 19.5 | Elevation | Hoz. | +45 cut |
| AF8 (51) | 19.5 | Elevation | Vert. | +45 cut |
| AF9 (52) | 19.5 | Elevation | Hoz. | +90 cut |
| AF10 (53) | 19.5 | Elevation | Vert. | +90 cut |
| AF11 (54) | 19.5 | Elevation | Hoz. | -45 cut |
| AF12 (55) | 19.5 | Elevation | Vert. | -45 cut |
| AF13 (56) | 19.5 | Elevation | Hoz. | 0-180** |
| AF14 (57) | 19.5 | Elevation | Vert. | 0-180** |

*Page Numbers

**Tower Ext. Both Sides



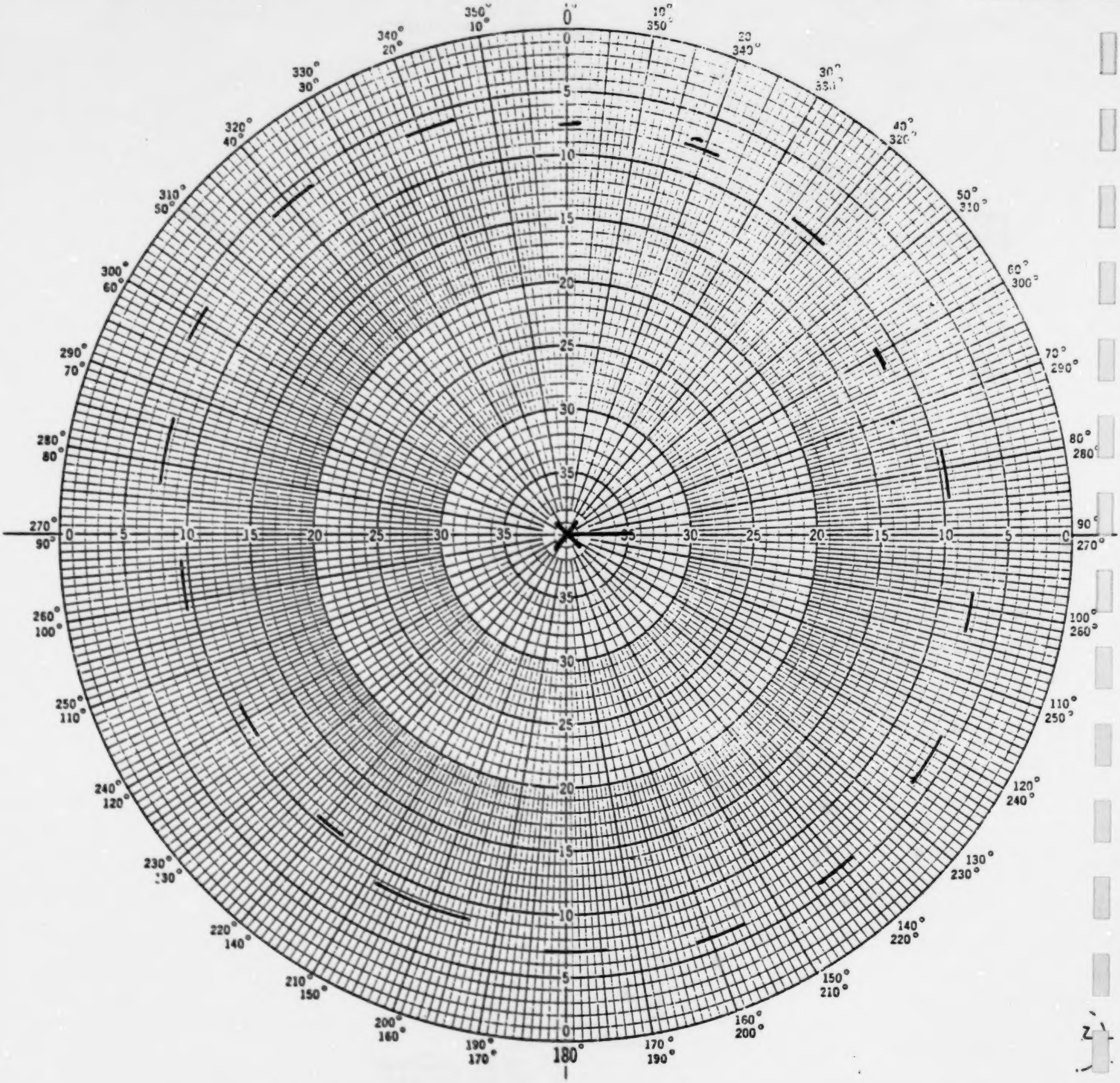


**MCi Micro Communications Inc.**

DATE: 8/3/81

MODEL: A

PATTERN NO.: AF1



PATTERN: AXIAL RATIO

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: ________

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

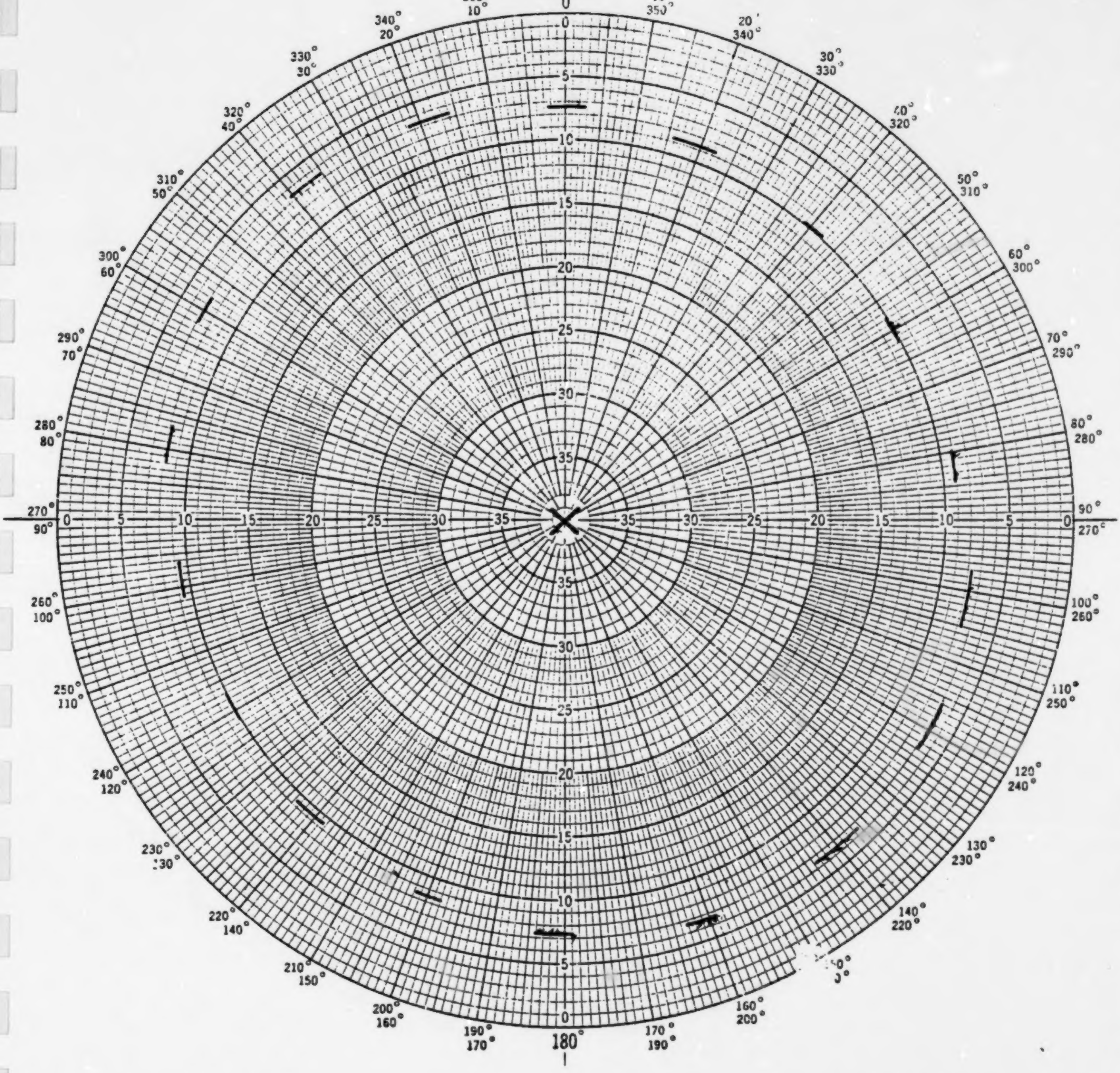
RING RADIUS: 51"

Micro
Communications
Inc.

DATE: 8/3/81

MODEL: A

PATTERN NO.: AFZ



PATTERN: AXIAL RATIO

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: ______

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

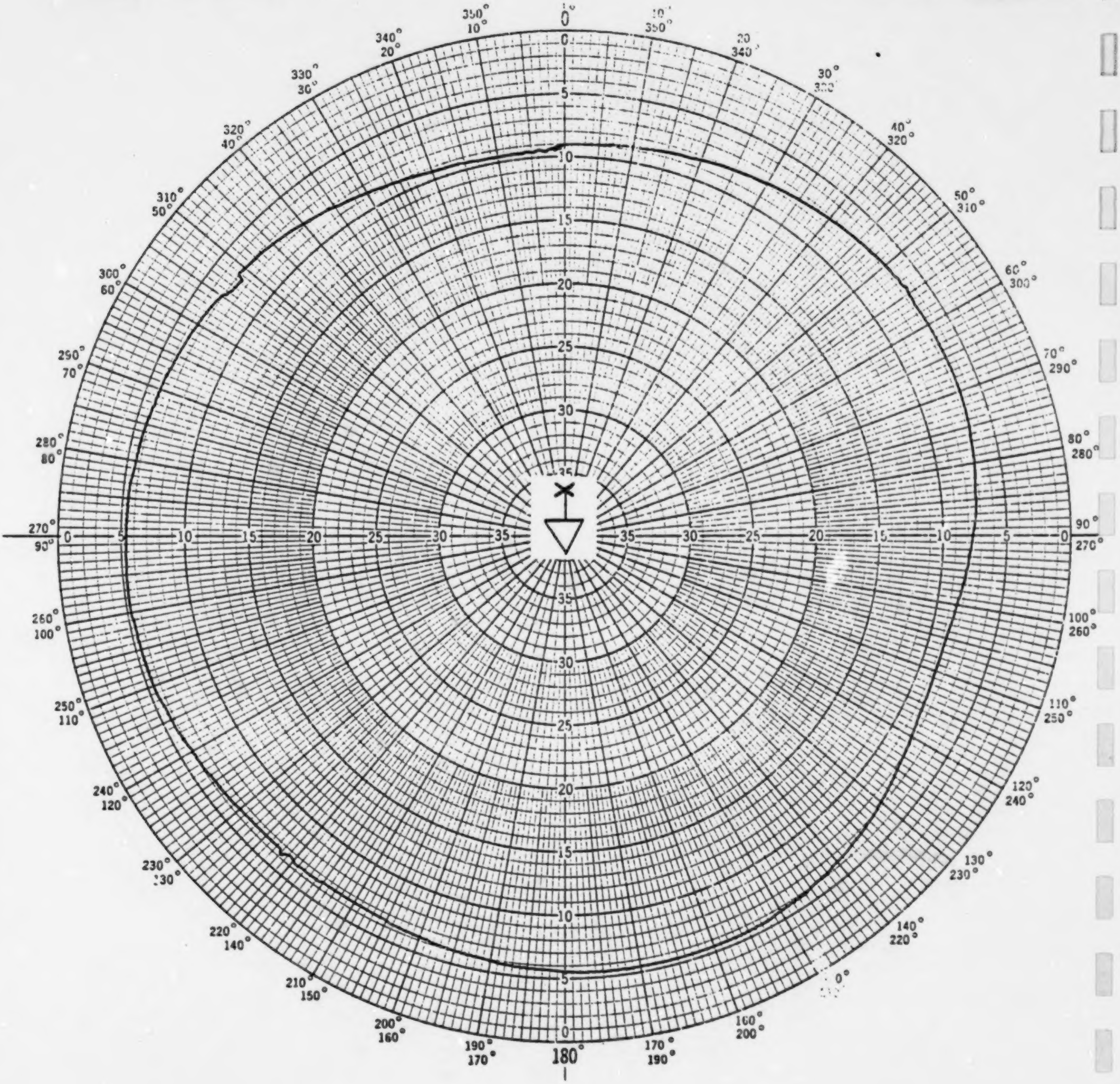
RING RADIUS: 52"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: A

PATTERN NO.: AF3



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

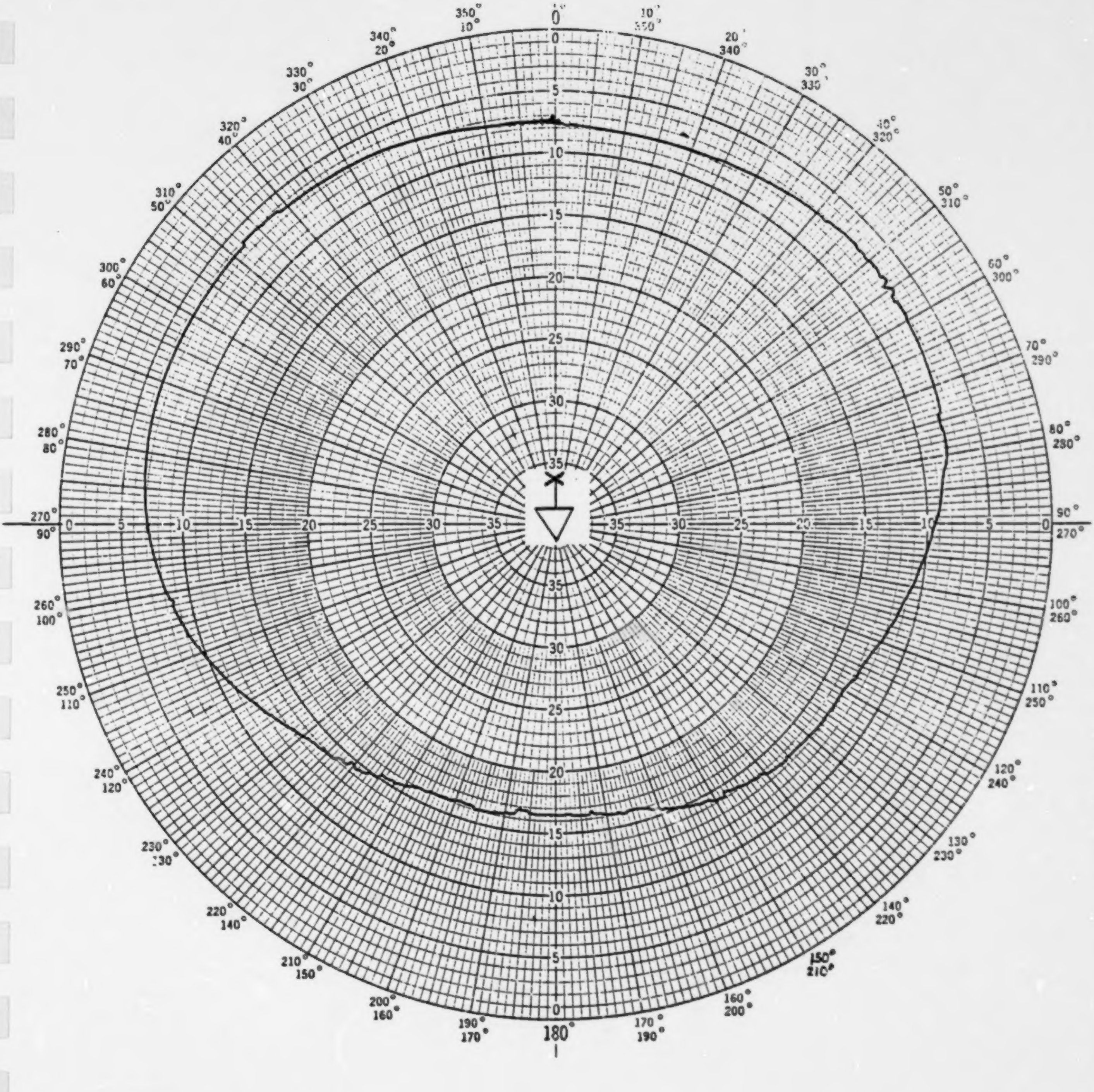
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: A

PATTERN NO.: AF4



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

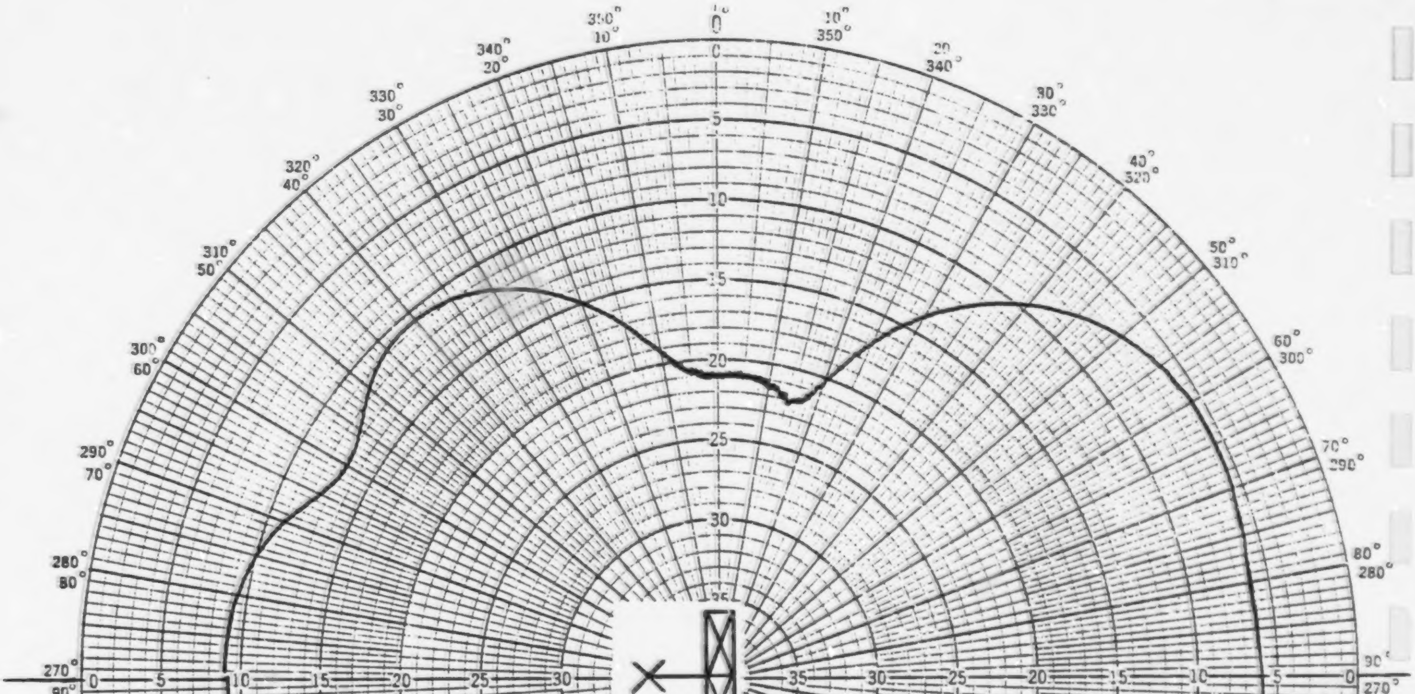
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: A

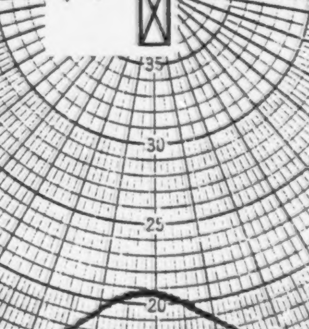
PATTERN NO.: AF5



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

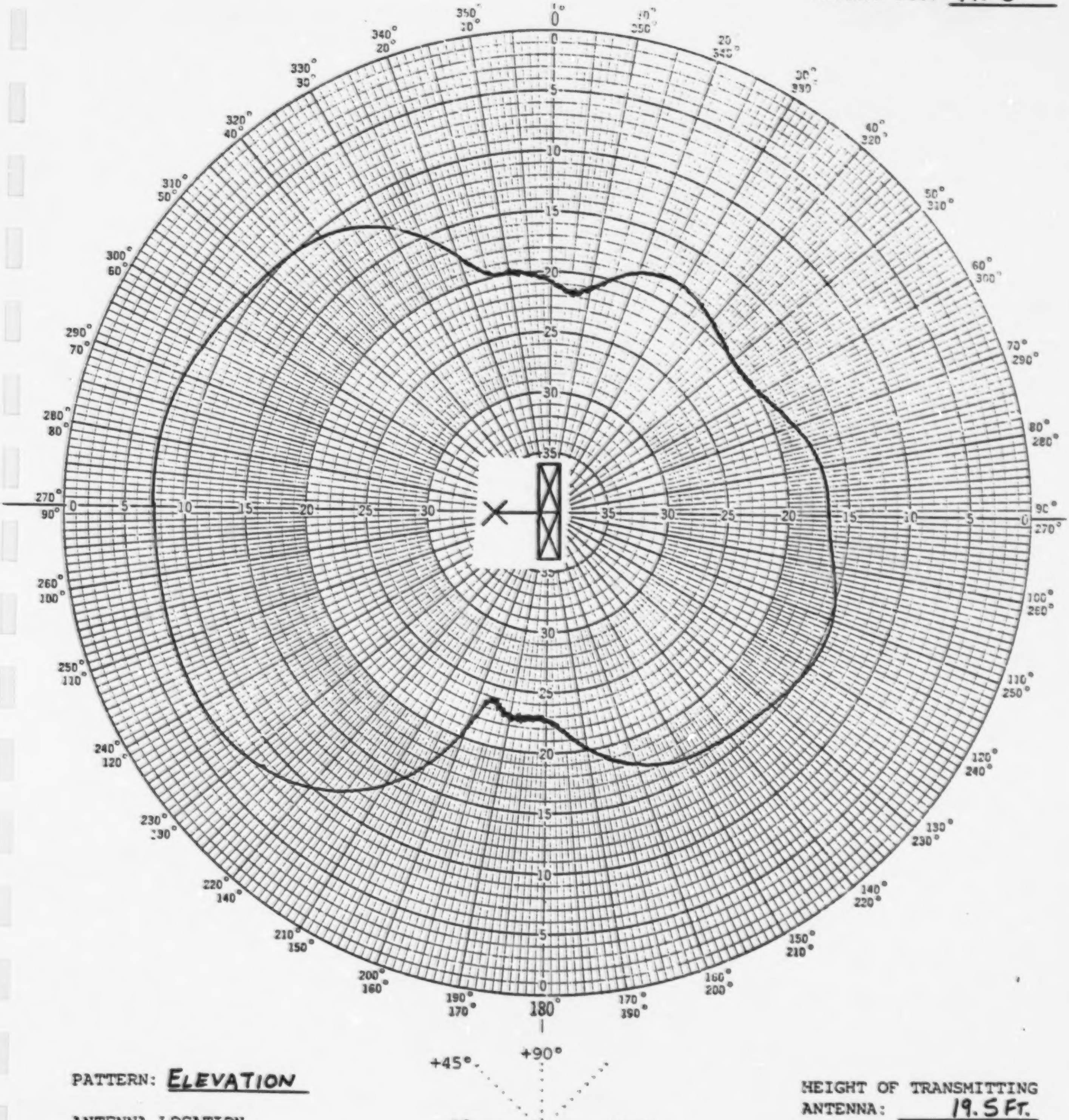
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: A

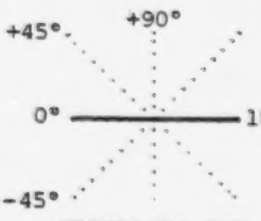
PATTERN NO.: AF6



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

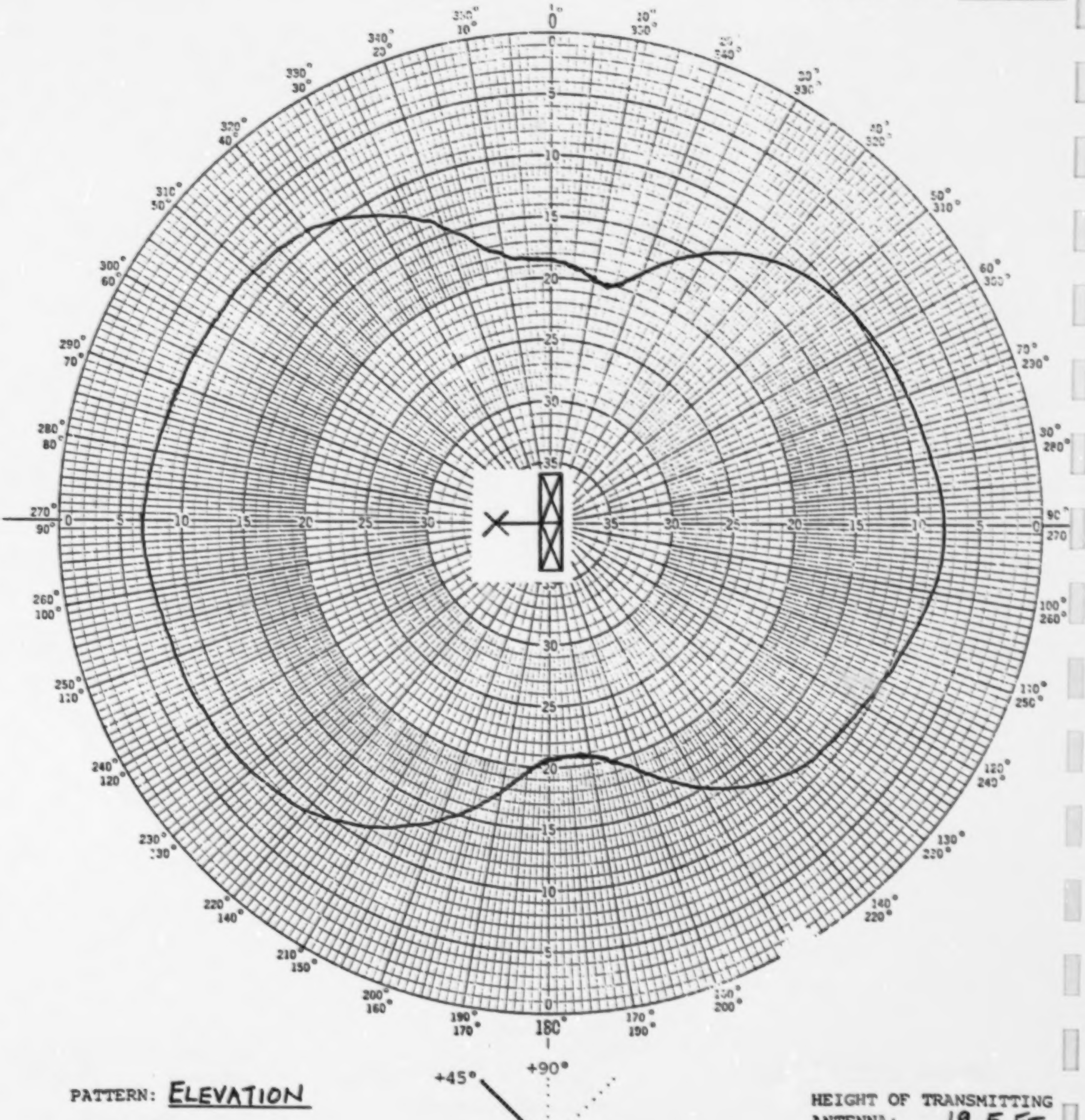
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: A

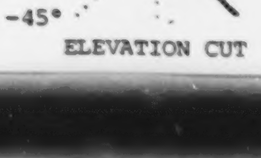
PATTERN NO.: AF7



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: HOz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

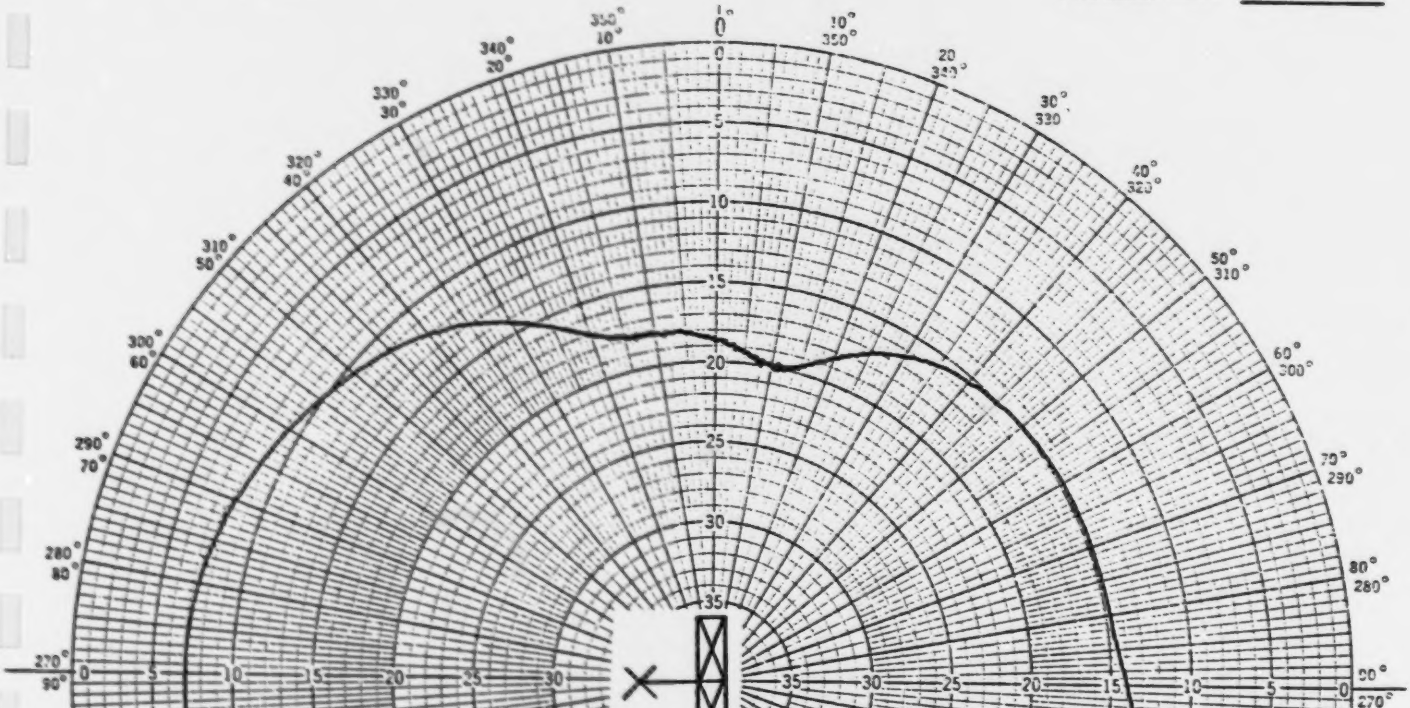
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: A

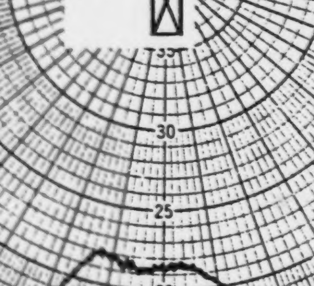
PATTERN NO.: AF8



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

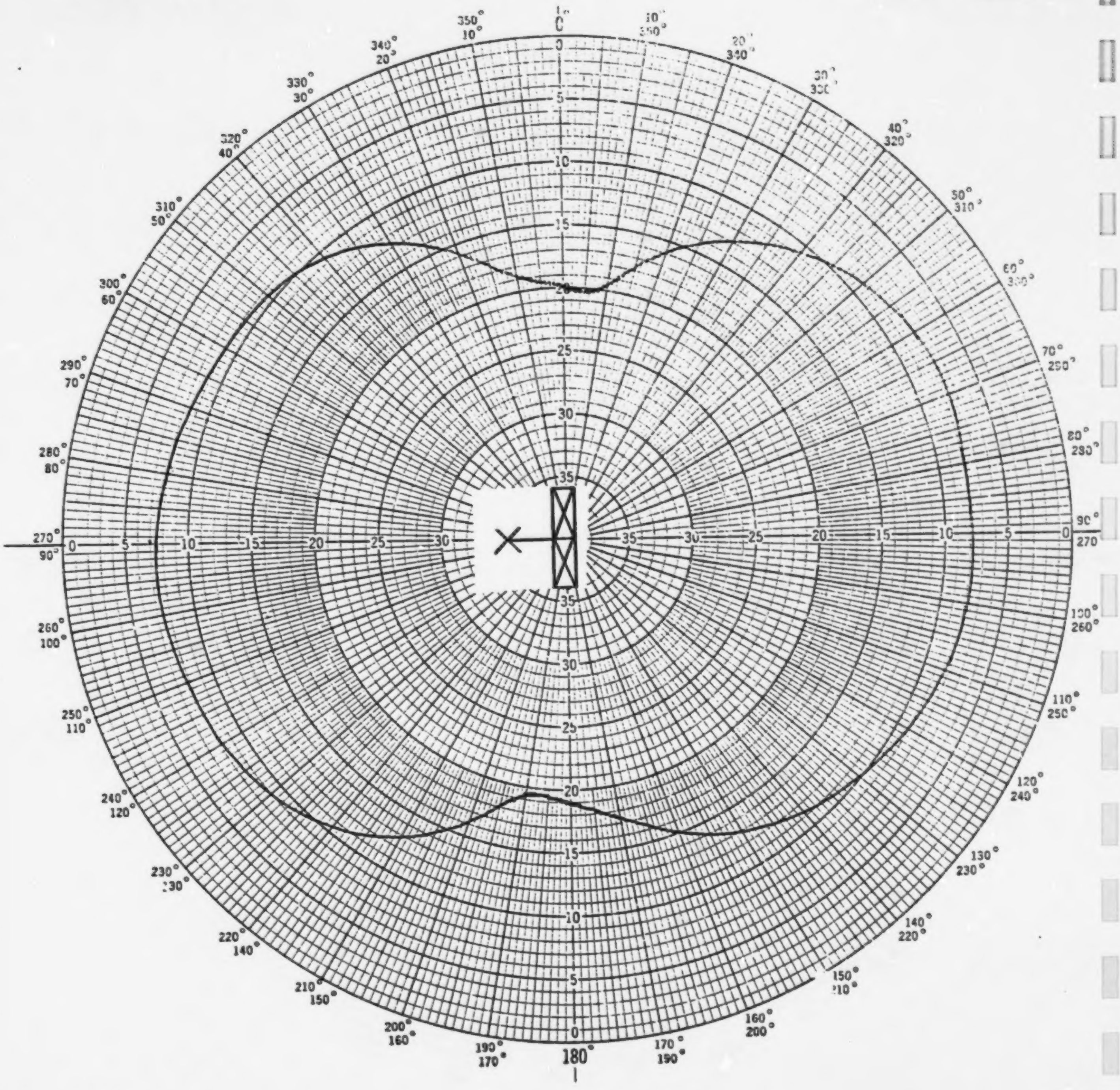
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: A

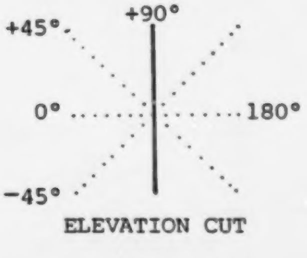
PATTERN NO.: AF9



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

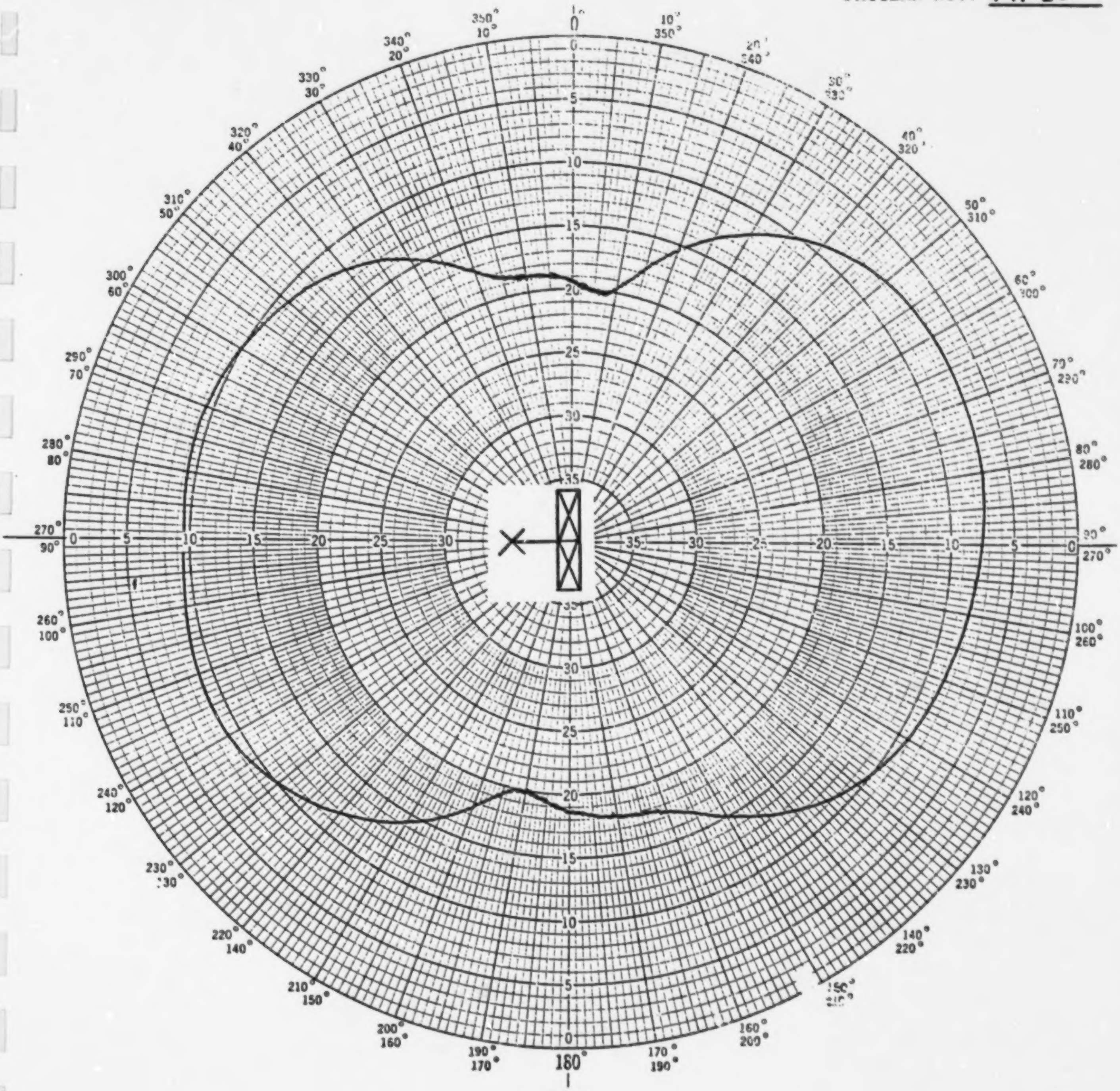
RING RADIUS: 51"

Micro
Communications
Inc.

DATE: 8/3/81

MODEL: A

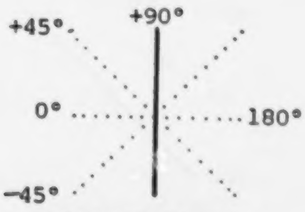
PATTERN NO.: AF10



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

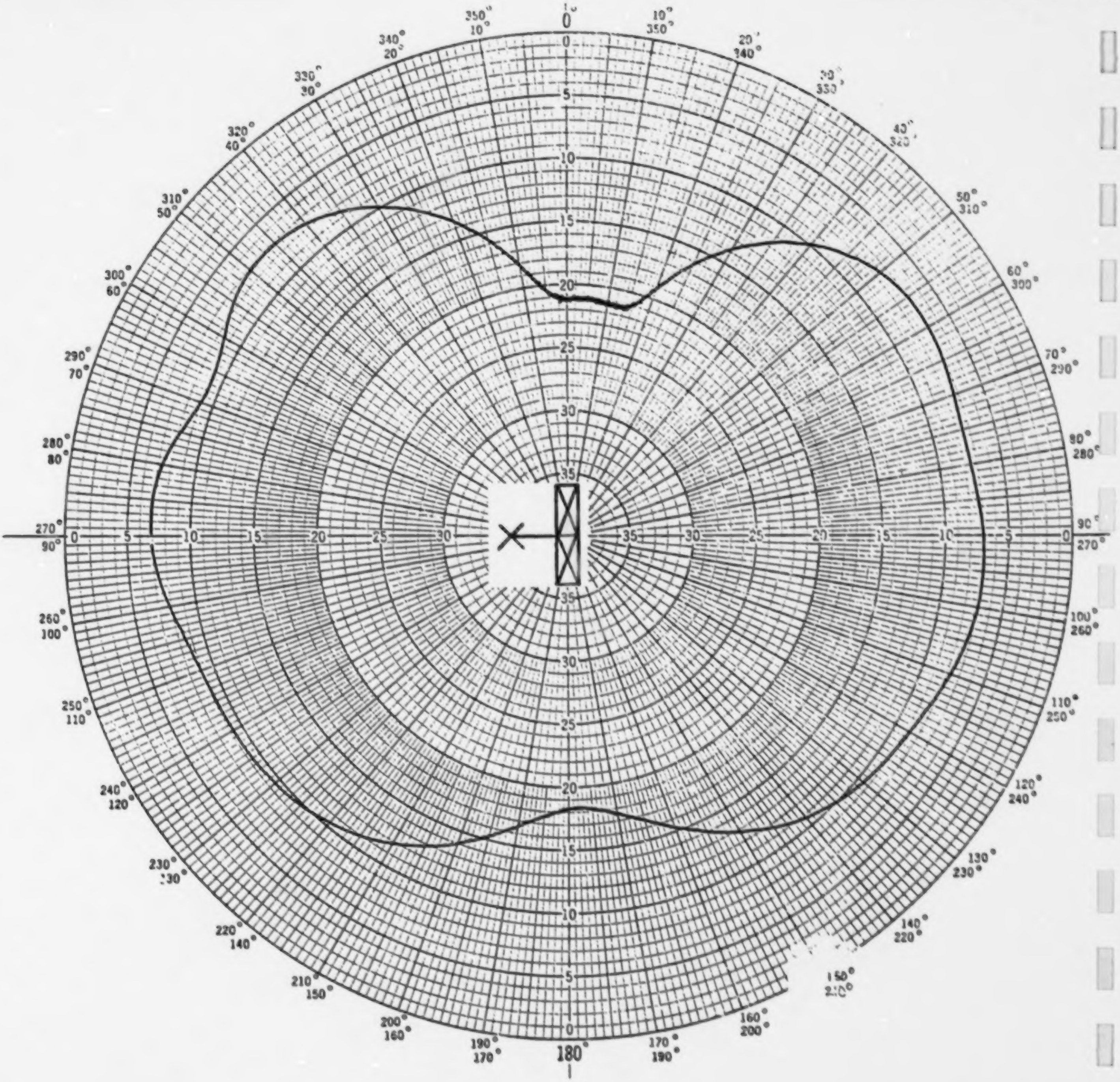
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: A

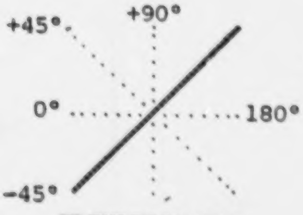
PATTERN NO.: AF11



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

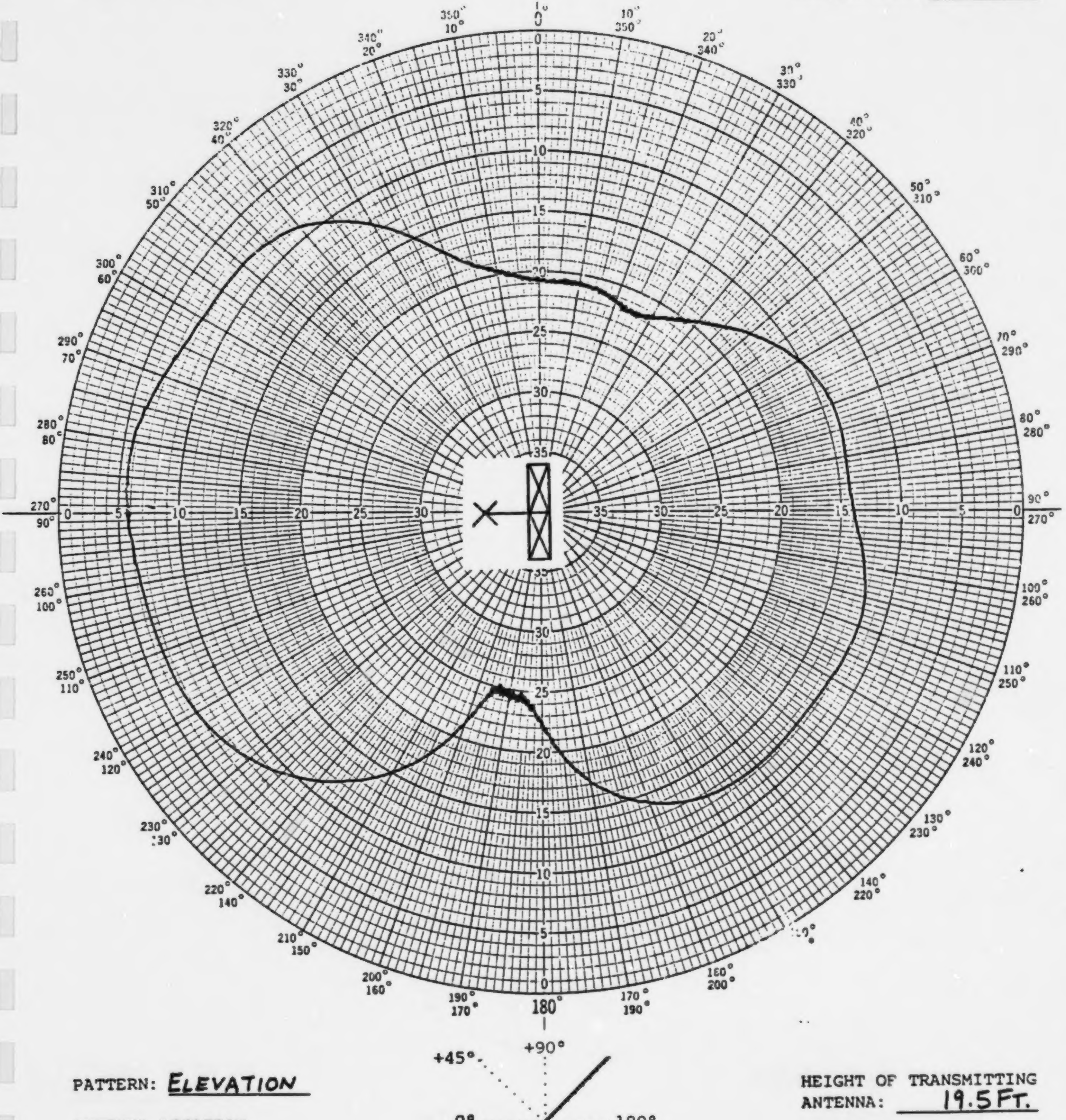
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: A

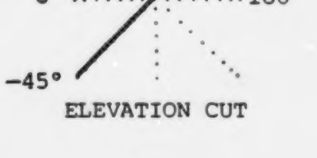
PATTERN NO.: AF12



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

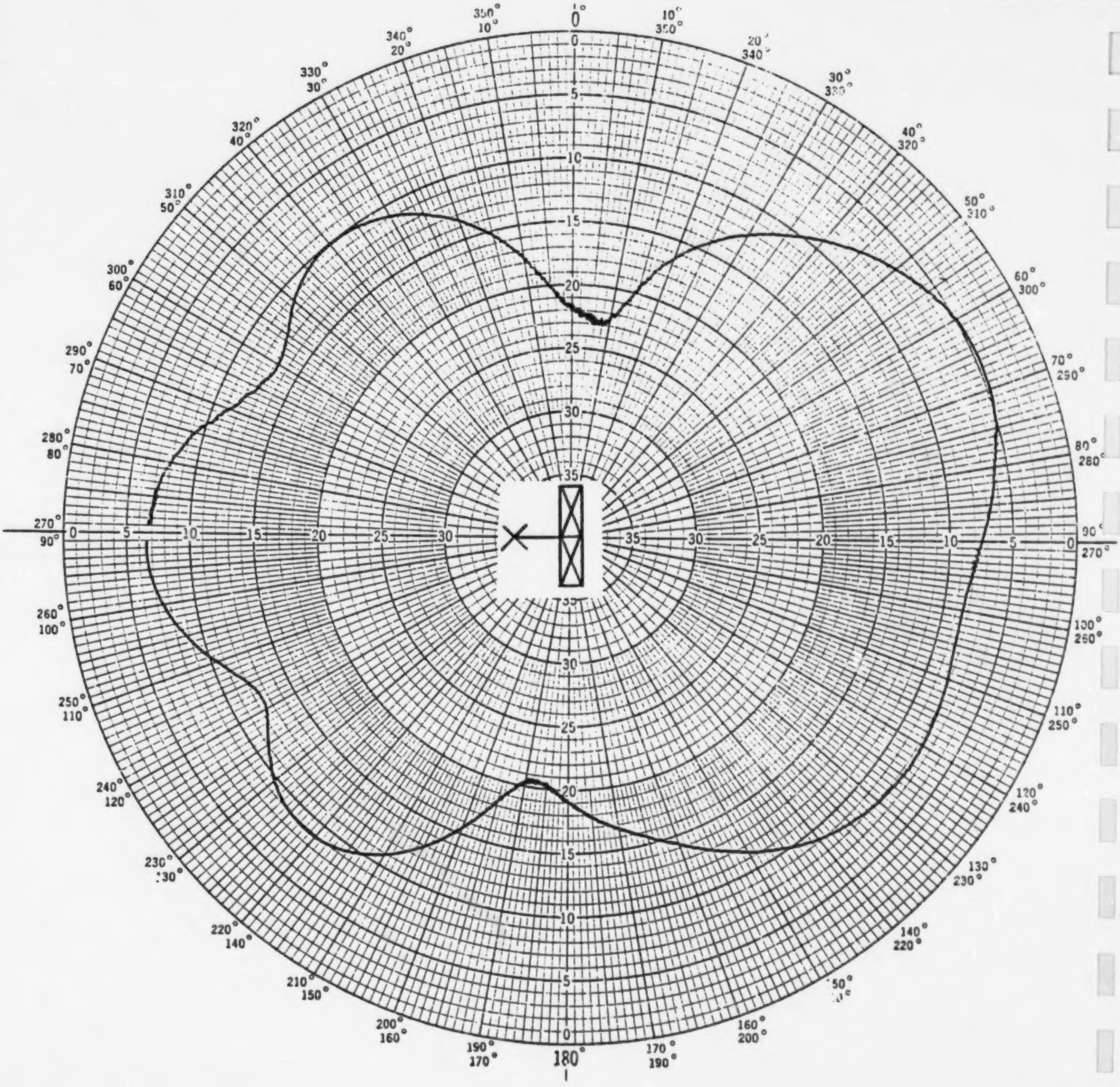
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: A

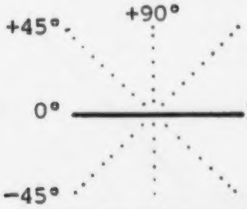
PATTERN NO.: AF13



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

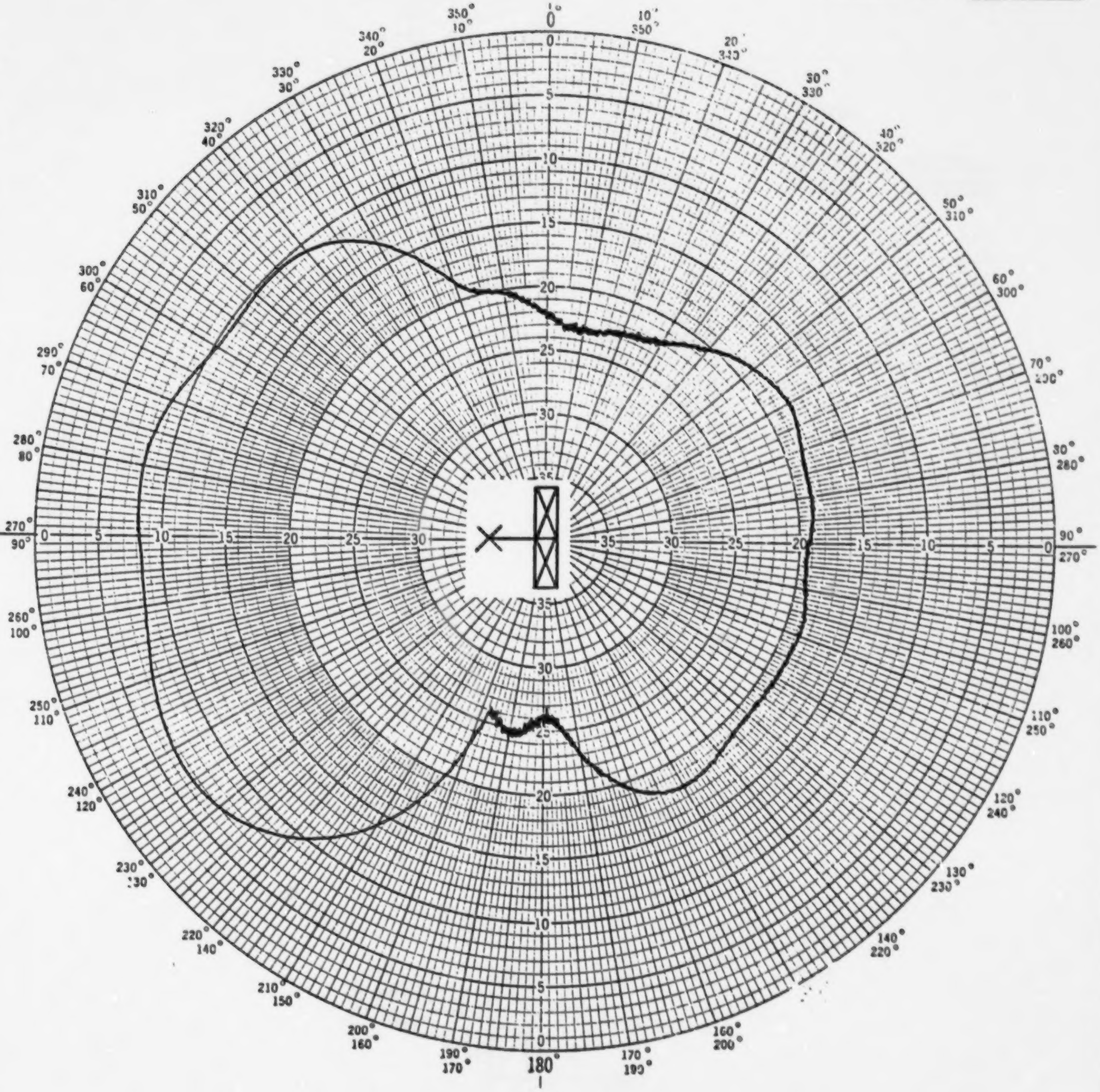
RING RADIUS: ______

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: A

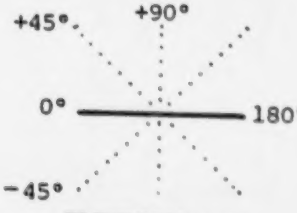
PATTERN NO.: AF14



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

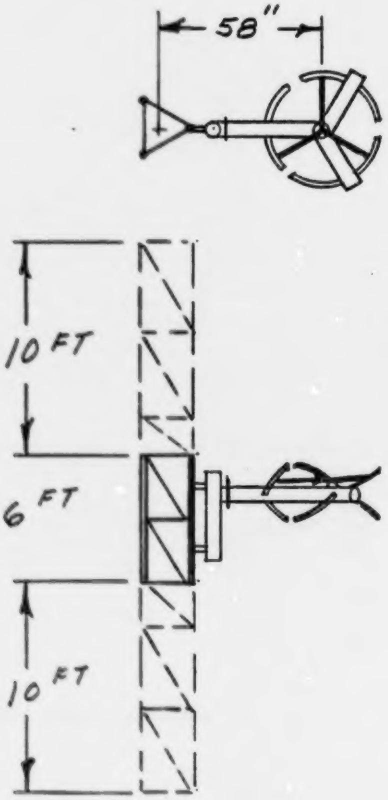
DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

RING RADIUS:

MODEL "A"
ANTENNA MOUNTED
ON TOWER LEG
August 5, 1981

| PATTERN NUMBER | * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLARIZATION | REMARKS |
|---|---|---|---|---|---|
| AL1 | (59) | 18.5 | Axial Ratio | | |
| AL2 | (60) | 18.5 | Azimuth | Hoz. | |
| AL3 | (61) | 18.5 | Azimuth | Vert. | |
| AL4 | (62) | 18.5 | Elevation | Hoz. | 0-180 cut |
| AL5 | (63) | 18.5 | Elevation | Vert. | 0-180 cut |
| AL6 | (64) | 18.5 | Elevation | Hoz. | +45 cut |
| AL7 | (65) | 18.5 | Elevation | Vert. | +45 cut |
| AL8 | (66) | 18.5 | Elevation | Hoz. | +90 cut |
| AL9 | (67) | 18.5 | Elevation | Vert. | +90 cut |
| AL10 | (68) | 18.5 | Elevation | Hoz. | -45 cut |
| AL11 | (69) | 18.5 | Elevation | Vert. | -45 cut |
| AL12 | (70) | 18.5 | Elevation | Hoz. | 0-180, tower extended |
| AL13 | (71) | 18.5 | Elevation | Vert. | 0-180, tower extended |

*Page Numbers

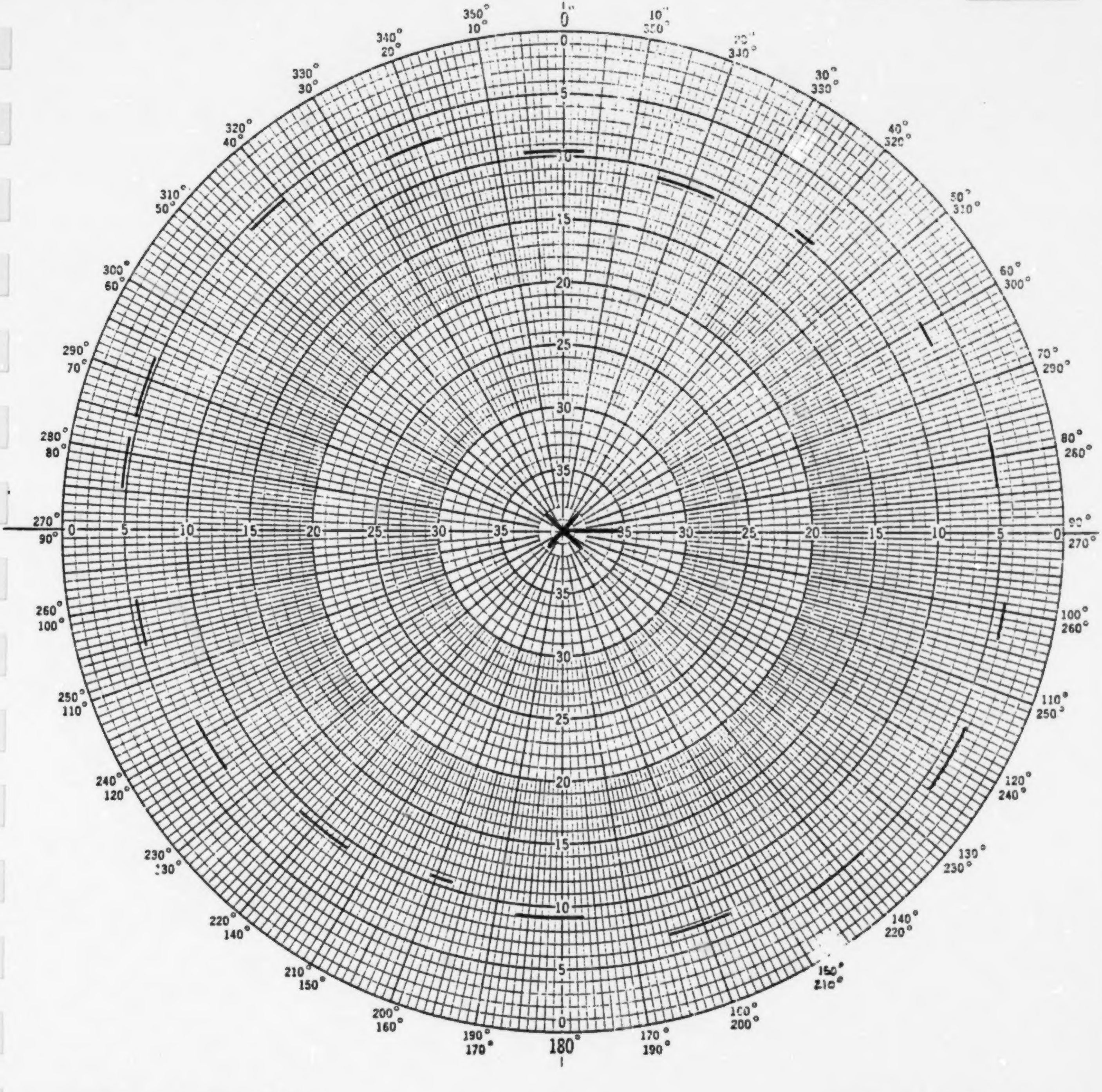


**Micro Communications Inc.**

DATE: 8/5/81

MODEL: A

PATTERN NO.: AL1



PATTERN: AXIAL RATIO

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: ______

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

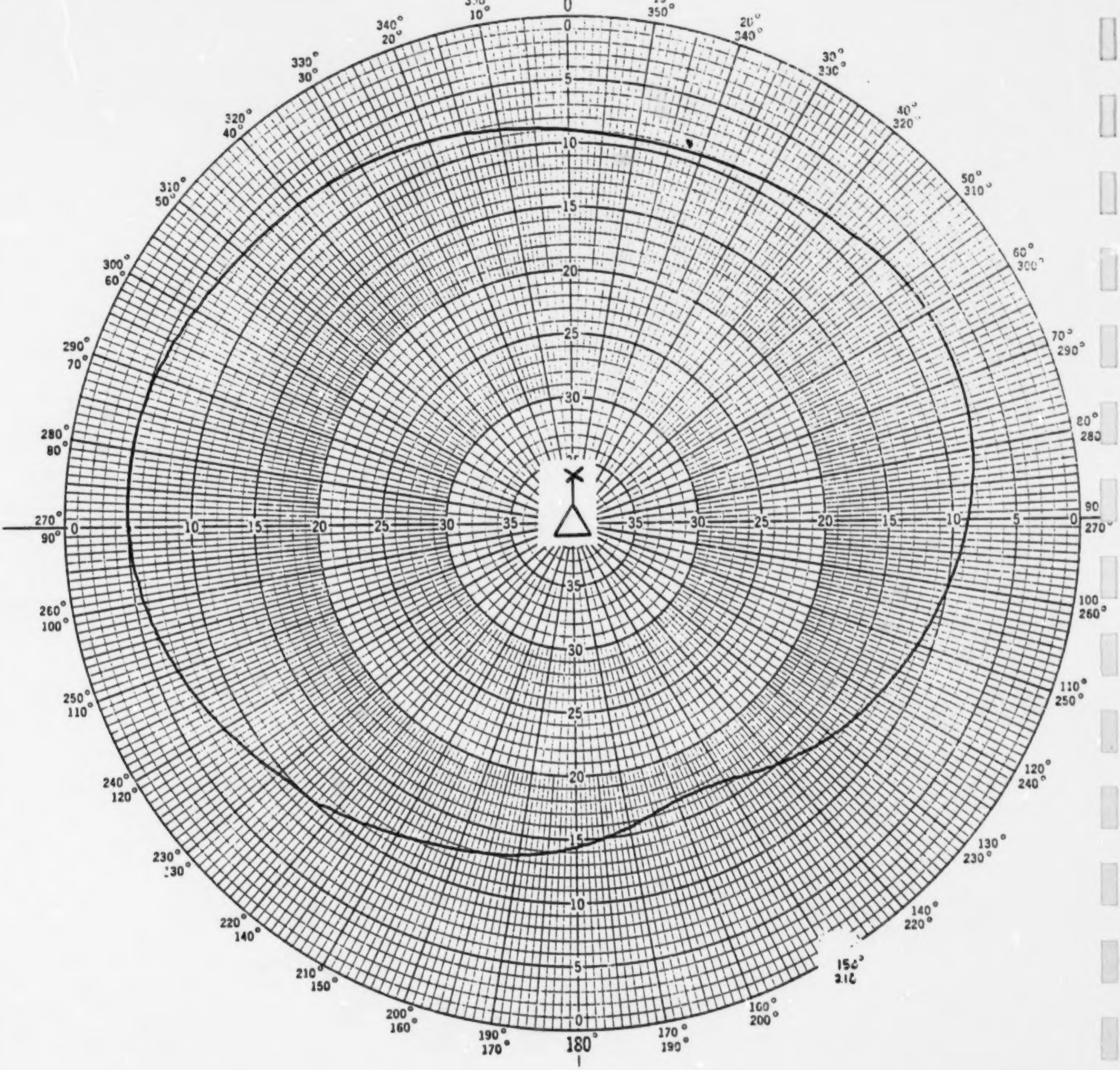
RING RADIUS: 58.5"

Micro
Communications
Inc.

DATE: 8/5/81

MODEL: A

PATTERN NO.: AL2



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

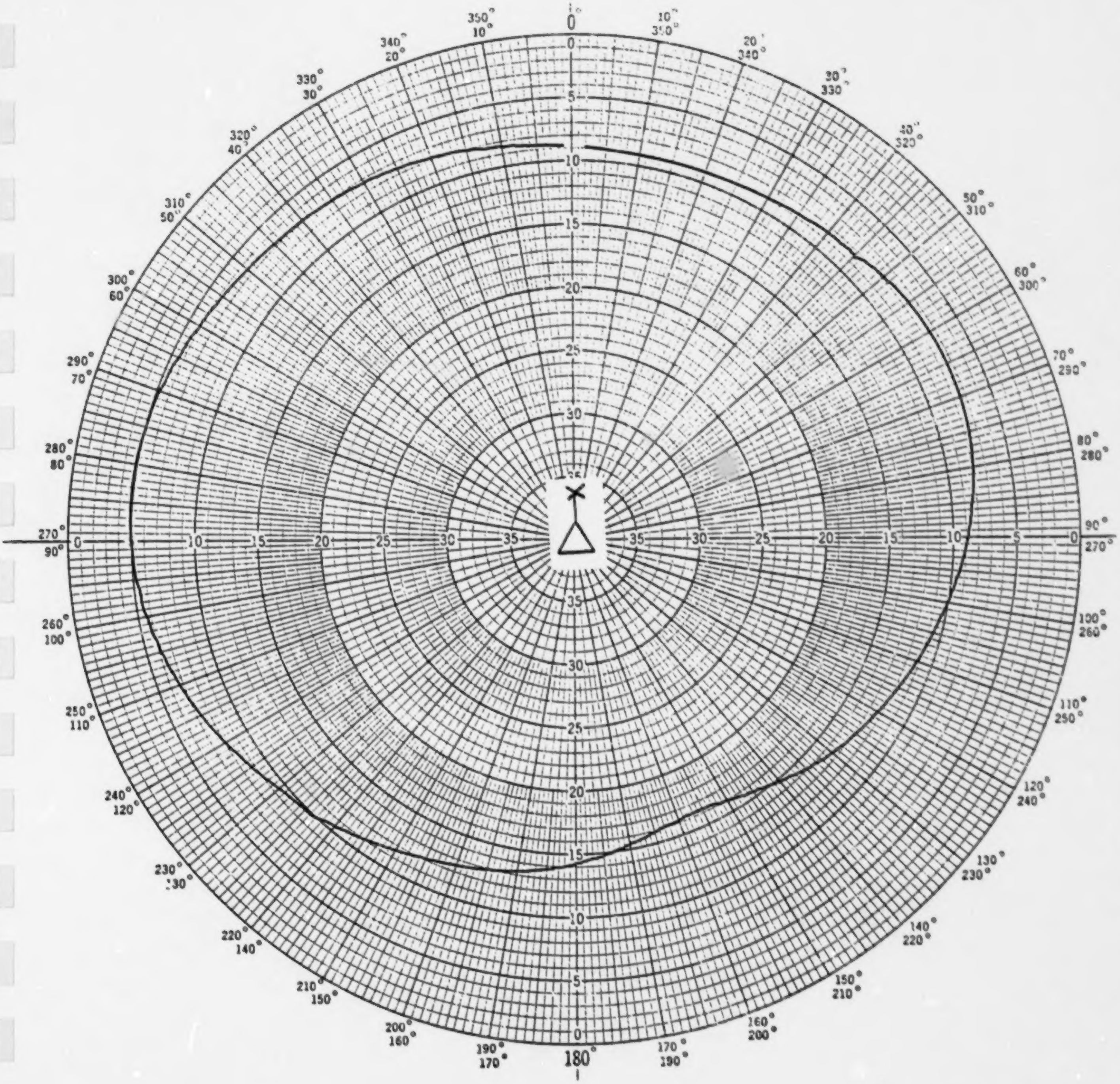
RING RADIUS: 58.5"

**MCi** Micro Communications Inc.

DATE: 8/5/81

MODEL: A

PATTERN NO.: AL3



PATTERN: AZIMUTH

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT

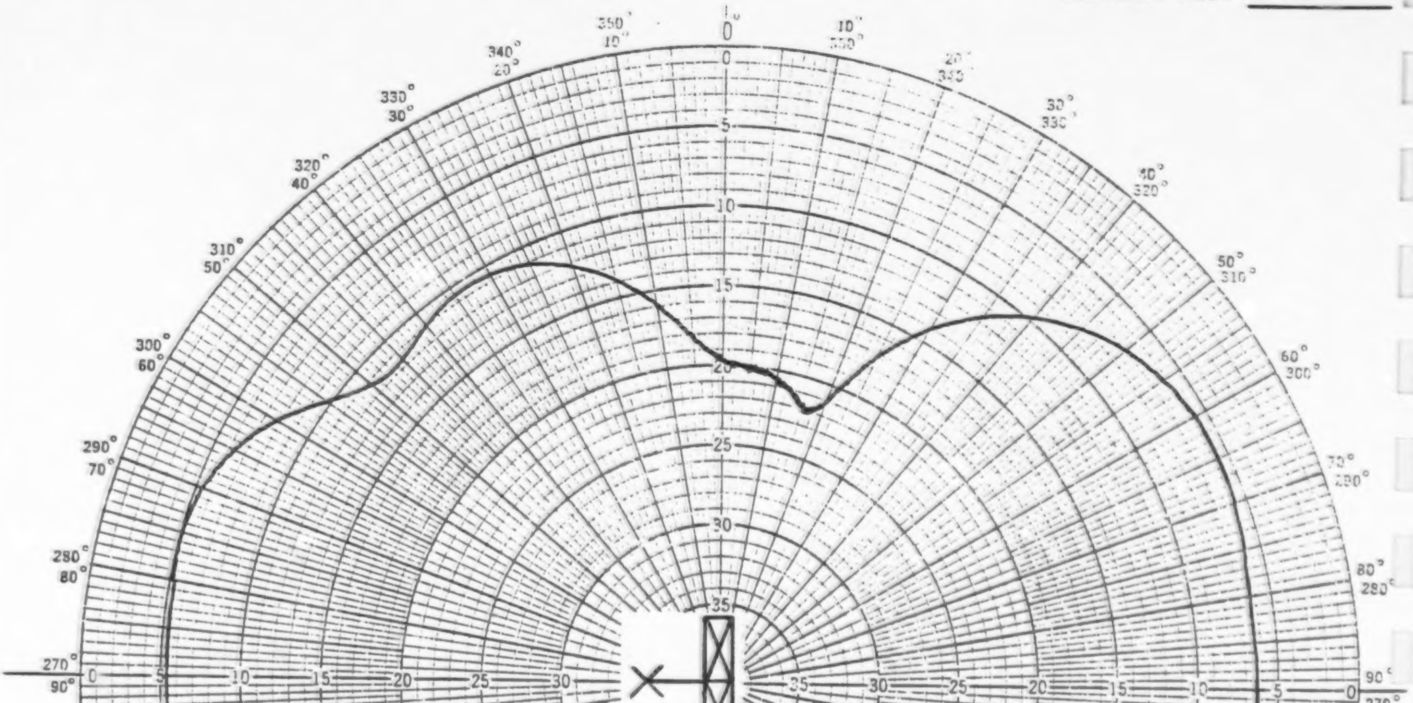
RING RADIUS: 58.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: A

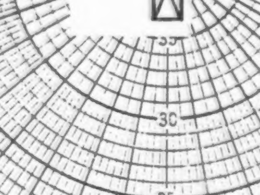
PATTERN NO.: AL4



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

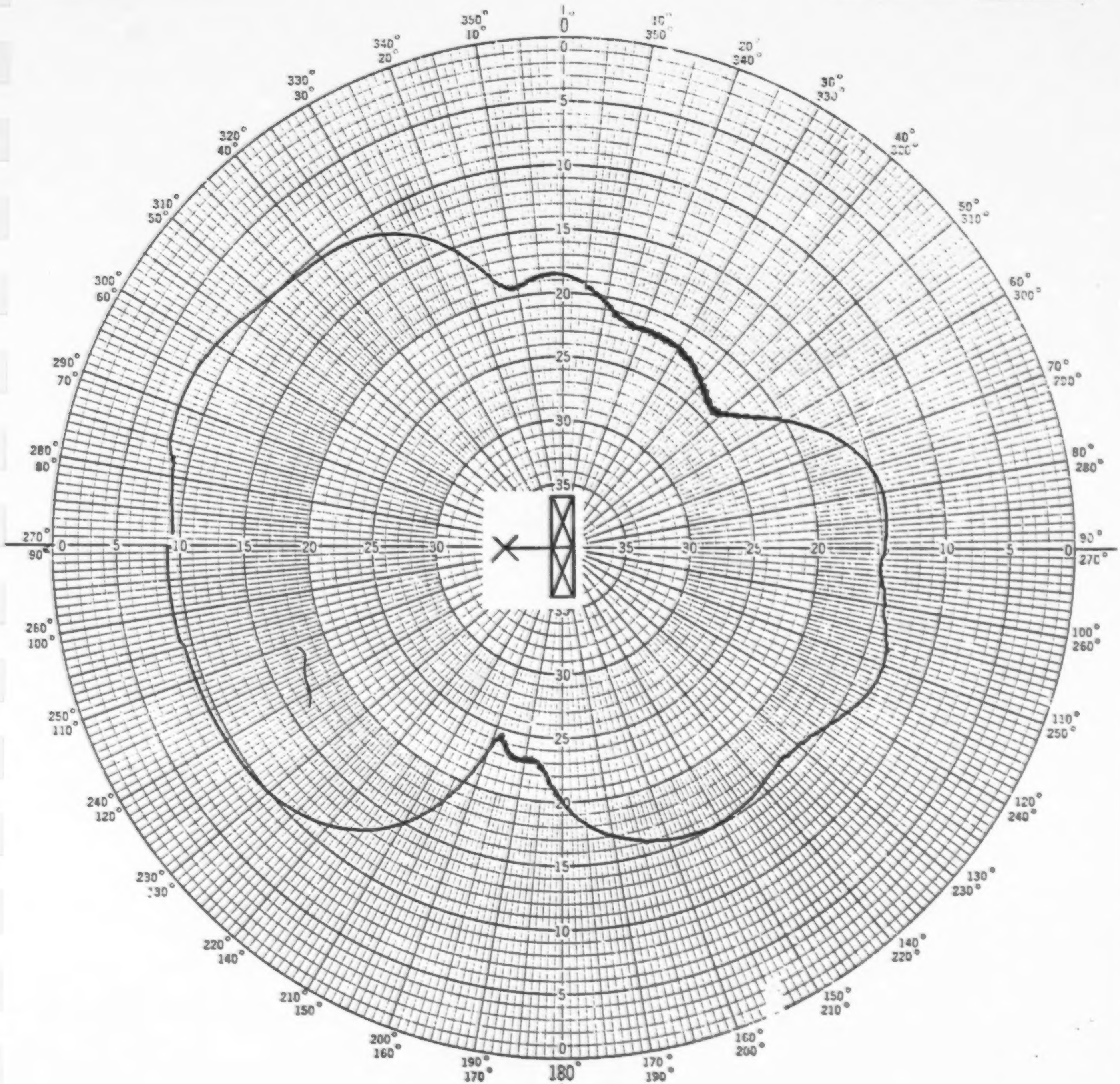
RING RADIUS: 58.5"

Micro
Communications
Inc.

DATE: 8/5/81

MODEL: A

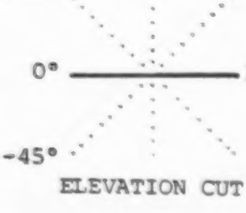
PATTERN NO.: AL5



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

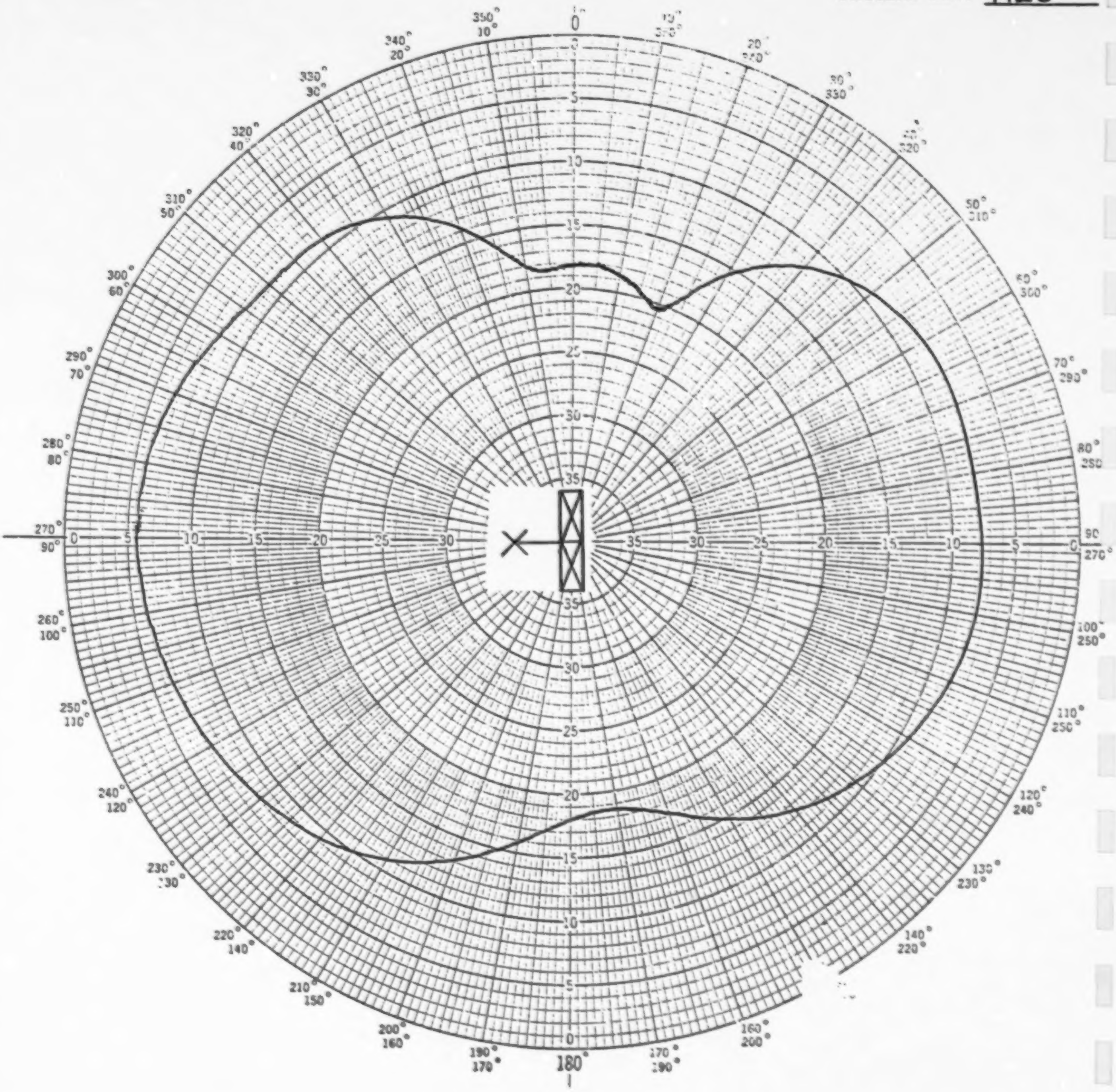
RING RADIUS: 58.5"

MCi Micro Communications Inc.

DATE: 8/5/81

MODEL: A

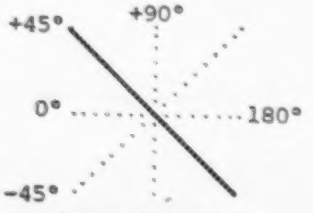
PATTERN NO.: AL6



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

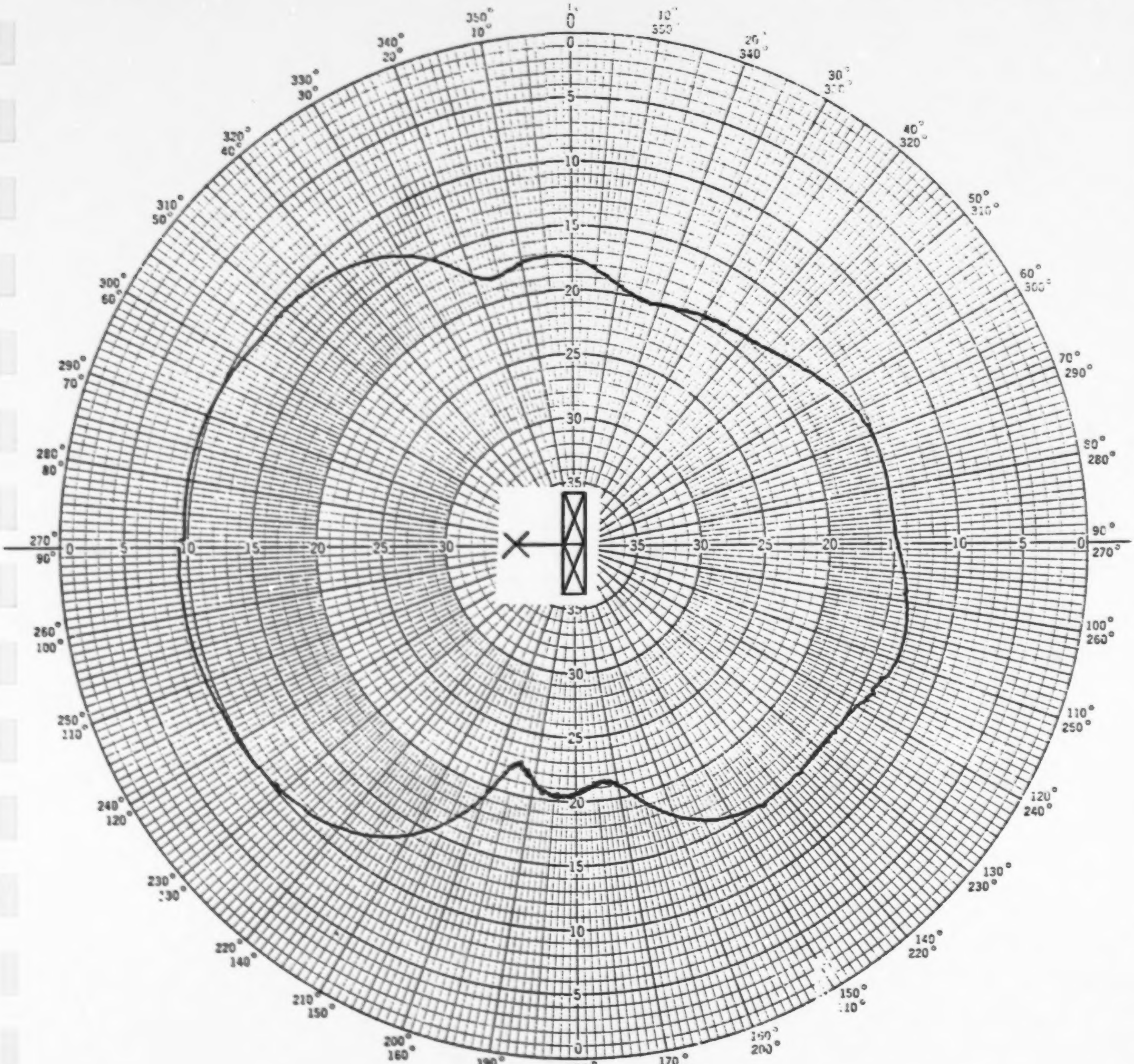
RING RADIUS: 58.5"

Micro
Communications
Inc.

DATE: 8/5/81

MODEL: A

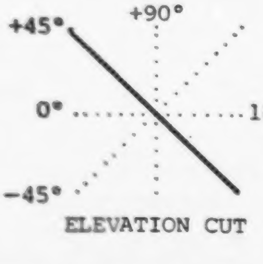
PATTERN NO.: AL7



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

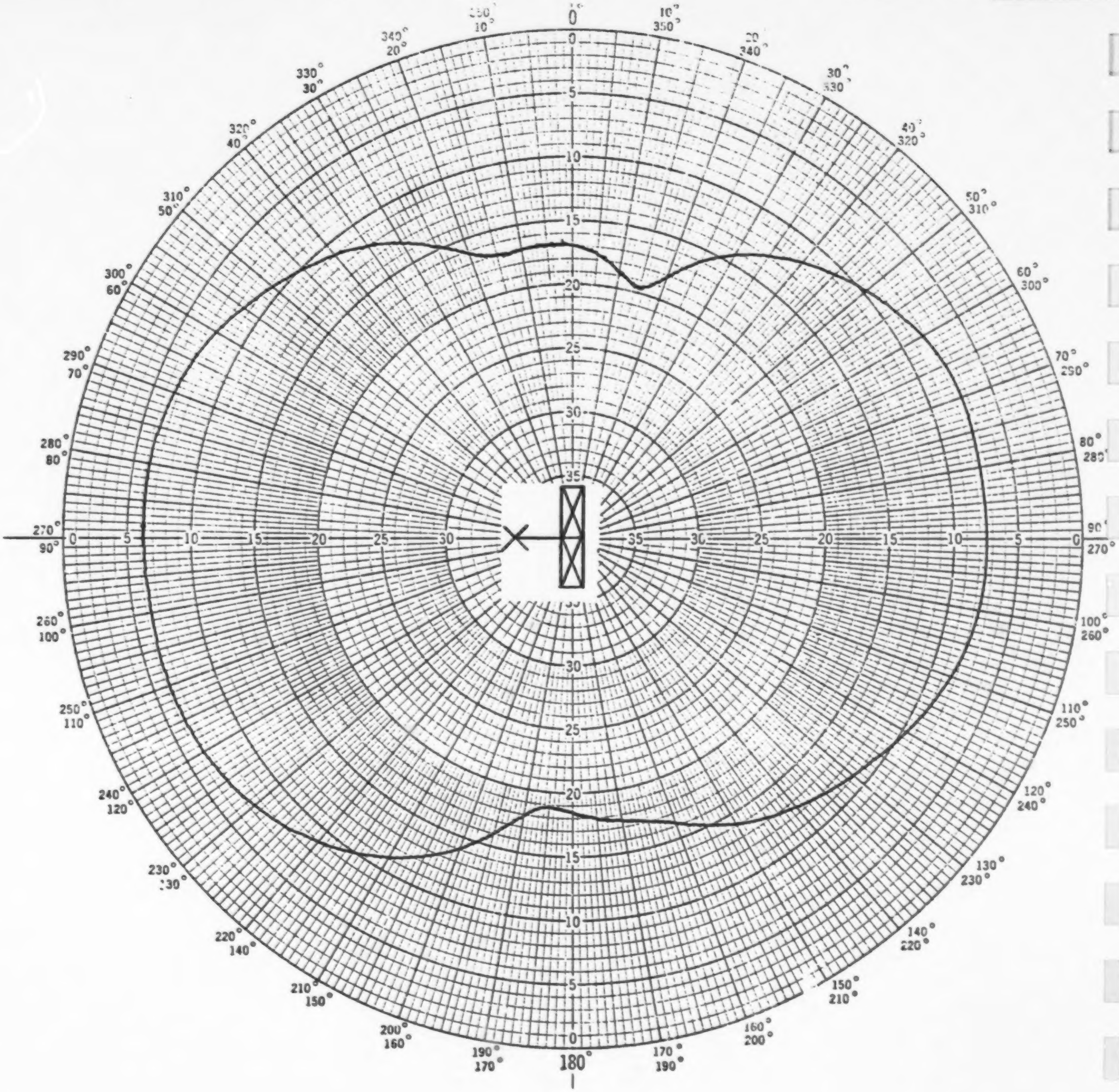
DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

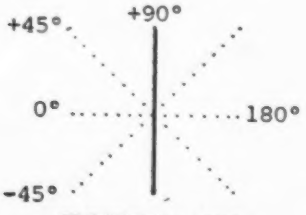
RING RADIUS: 58.5"

DATE: 8/5/81

MODEL: A

PATTERN NO.: AL8





ELEVATION CUT

PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.

HEIGHT OF TRANSMITTING ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

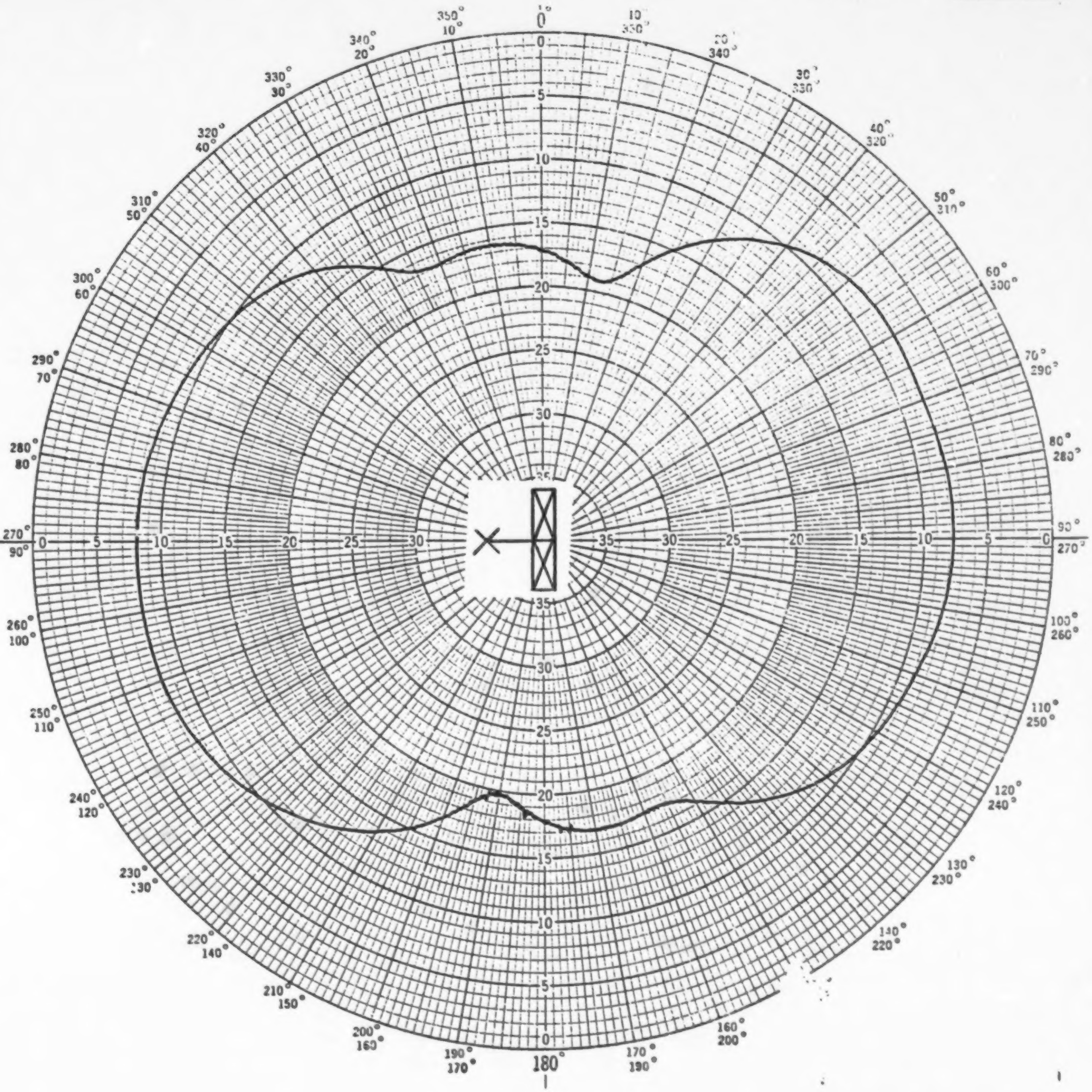
RING RADIUS: 58.5"

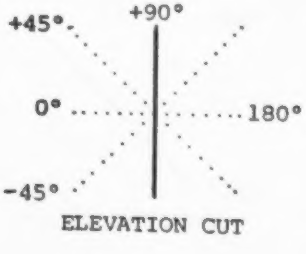
Micro
Communications
Inc.

DATE: 8/5/81

MODEL: A

PATTERN NO.: AL9





ELEVATION CUT

PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

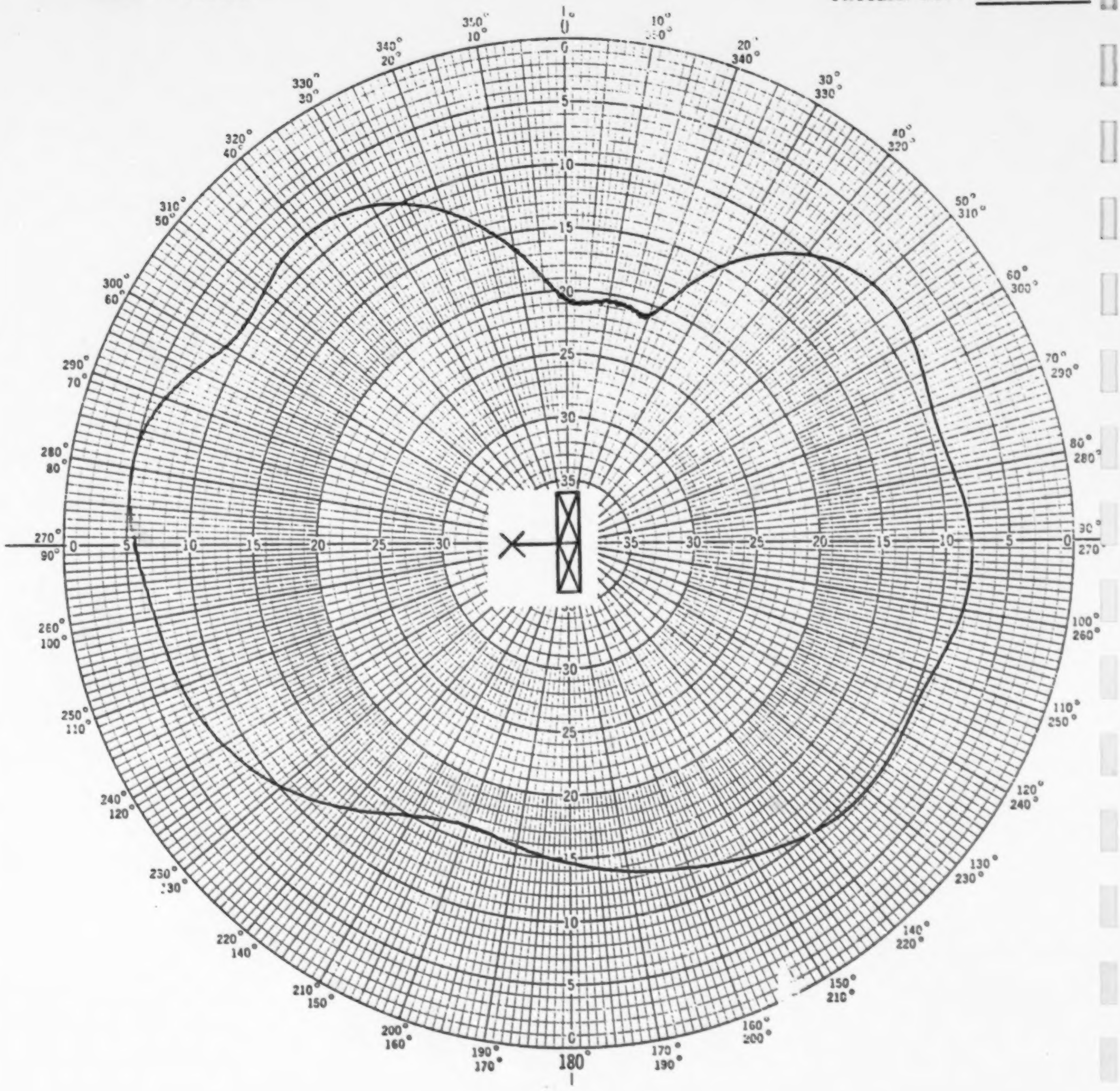
RING RADIUS: 58.5

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: A

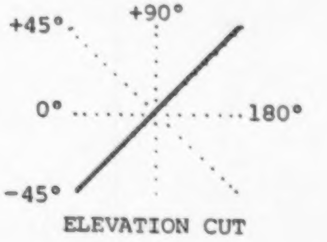
PATTERN NO.: AL10



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

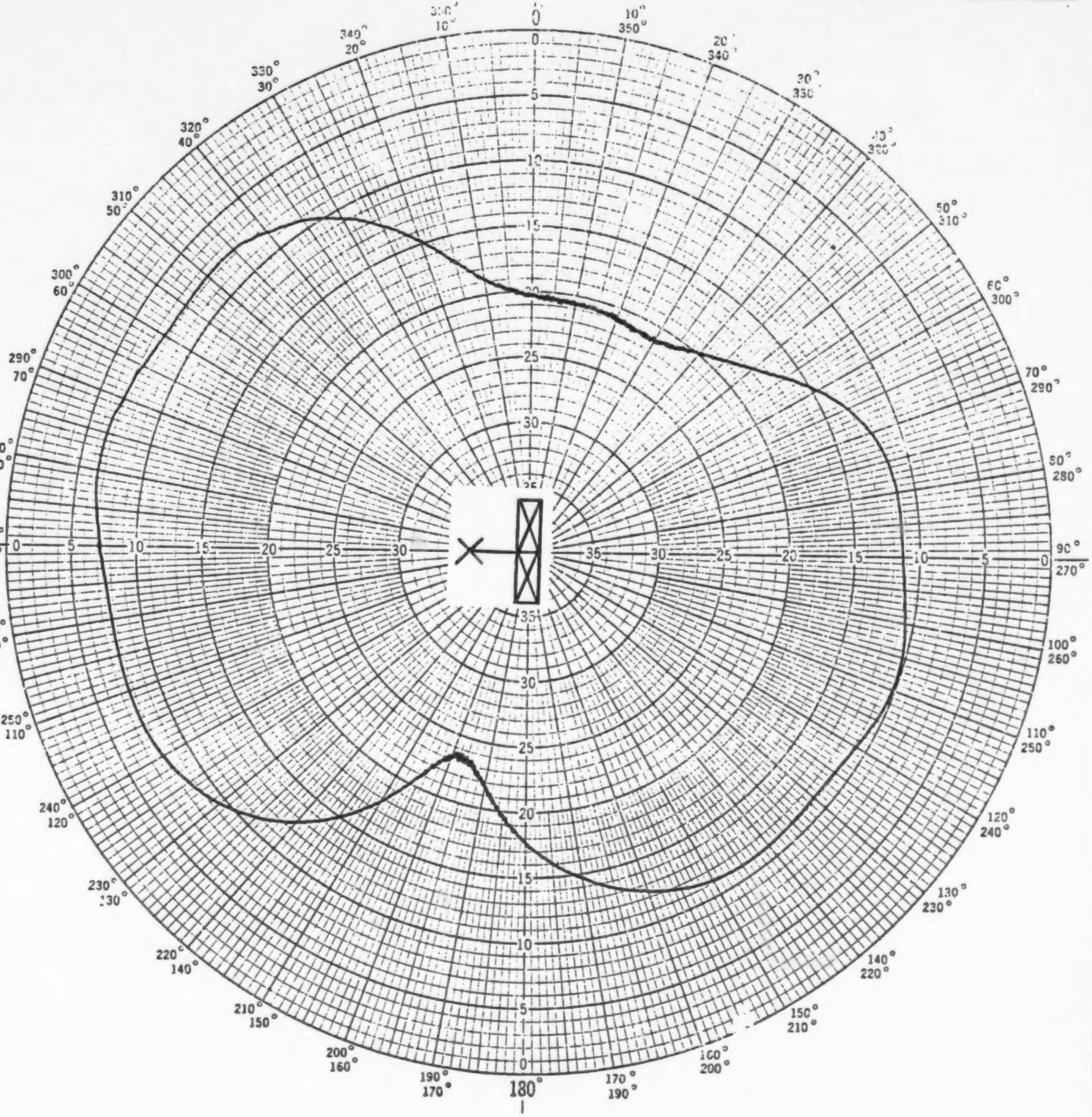
RING RADIUS: 58.5"

## Micro Communications Inc.

DATE: 8/5/81

MODEL: A

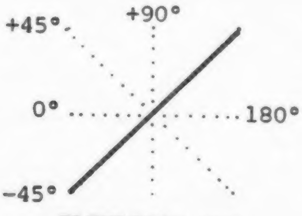
PATTERN NO.: AL11



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

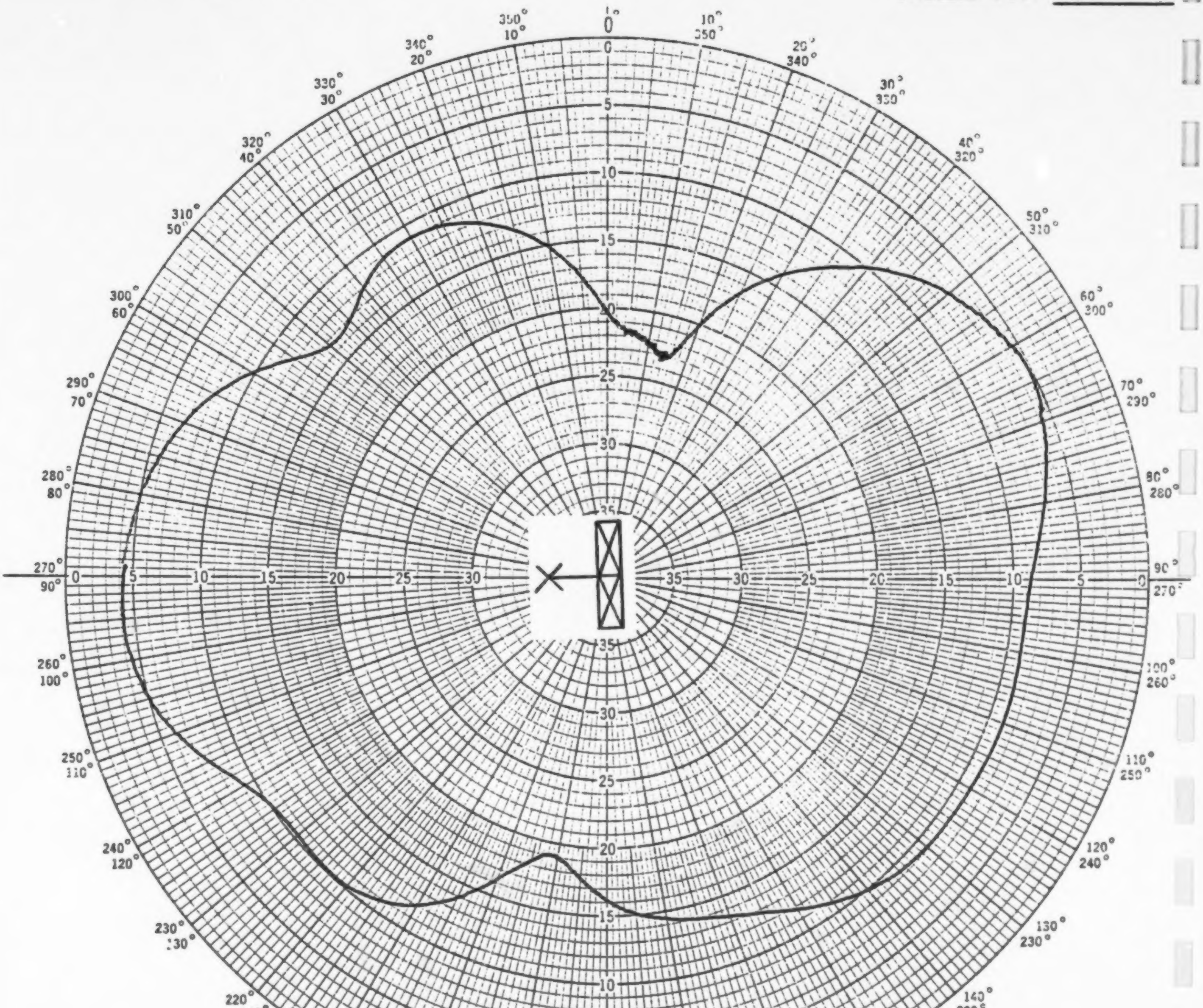
RING RADIUS: 58.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: A

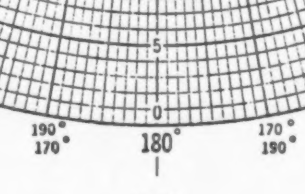
PATTERN NO.: AL12



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

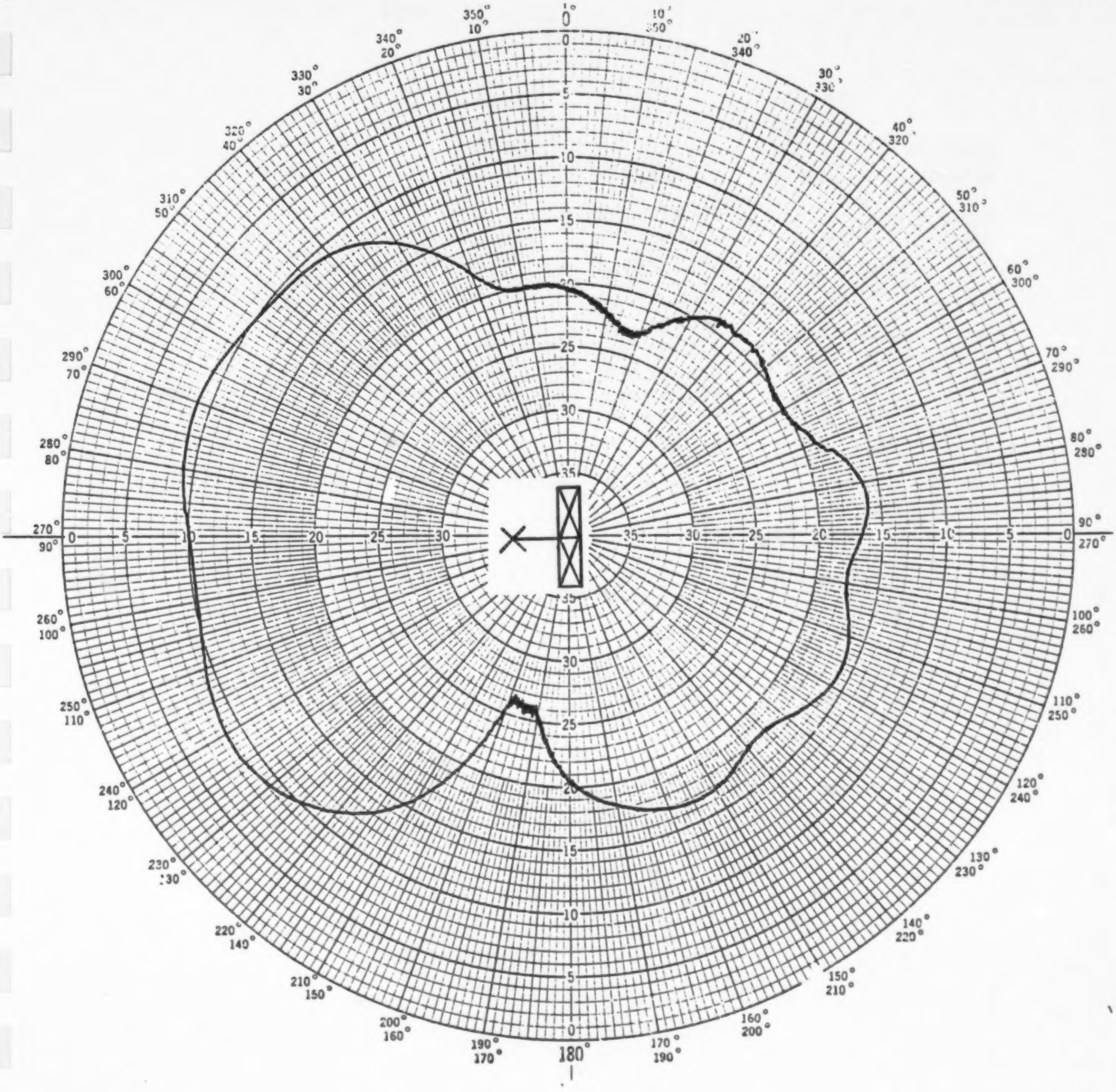
RING RADIUS: 58.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: A

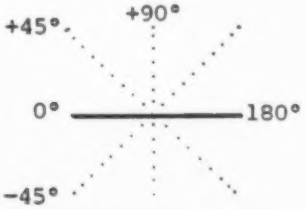
PATTERN NO.: AL13



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 18.5 FT.

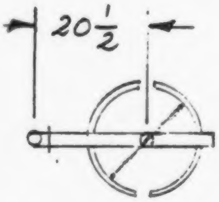
DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

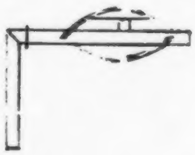
RING RADIUS: 58.5"

MODEL "B"
FREE SPACE MEASUREMENTS
July 31, 1981

| PATTERN NUMBER | * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLARIZATION | REMARKS |
|---|---|---|---|---|---|
| BFS1 | (73) | 16.5 | Axial Ratio | | |
| BFS2 | (74) | 16.5 | Azimuth | Hoz. | |
| BFS3 | (75) | 16.5 | Azimuth | Vert. | |
| BFS4 | (76) | 16.5 | Elevation | Hoz. | 0-180 cut |
| BFS5 | (77) | 16.5 | Elevation | Vert. | 0-180 cut |
| BFS6 | (78) | 16.5 | Elevation | Hoz. | +45 cut |
| BFS7 | (79) | 16.5 | Elevation | Vert. | +45 cut |
| BFS8 | (80) | 16.5 | Elevation | Hoz. | +90 cut |
| BFS9 | (81) | 16.5 | Elevation | Vert. | +90 cut |
| BFS10 | (82) | 16.5 | Elevation | Hoz. | -45 cut |
| BFS11 | (83) | 16.5 | Elevation | Vert. | -45 cut |

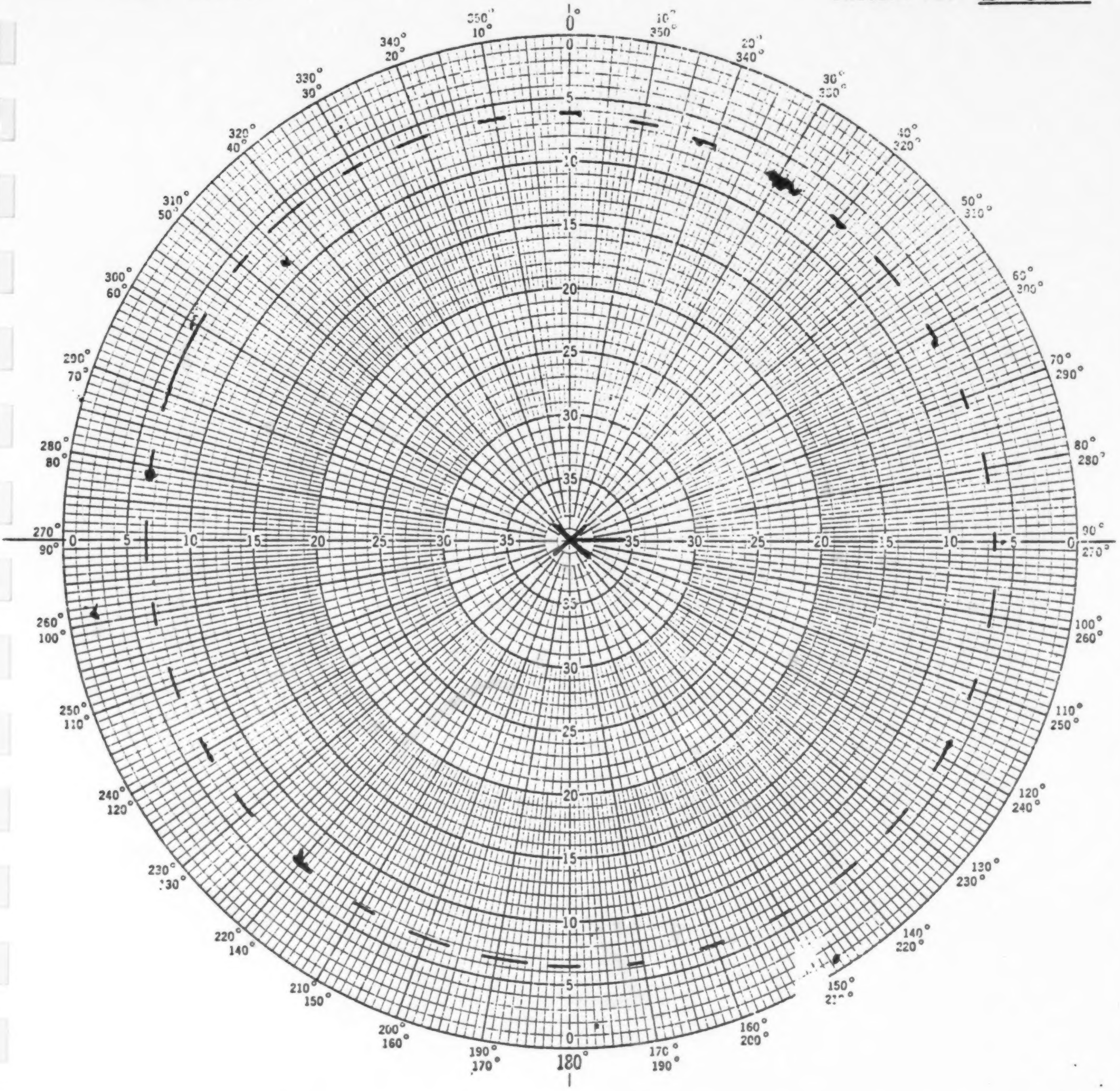
NOTE: All data taken with 20' x 10' Scattering Reflector at mid range
*Page Numbers





Micro
Communications
Inc.

DATE: 7/31/81
MODEL: B
PATTERN NO.: BFS1



PATTERN: AXIAL RATIO

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: ________

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

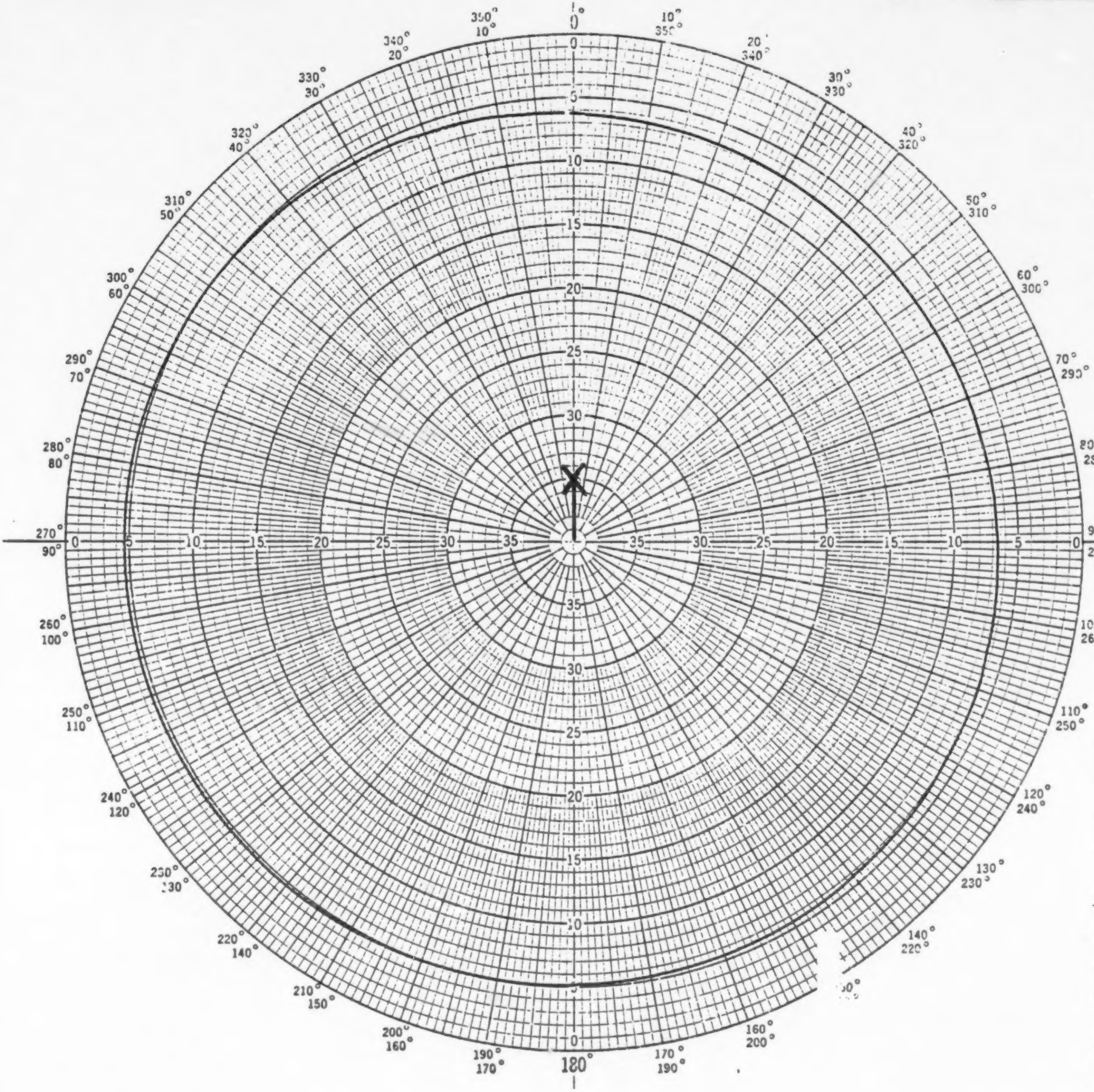
RING RADIUS: 20.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: B

PATTERN NO.: BFS2



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

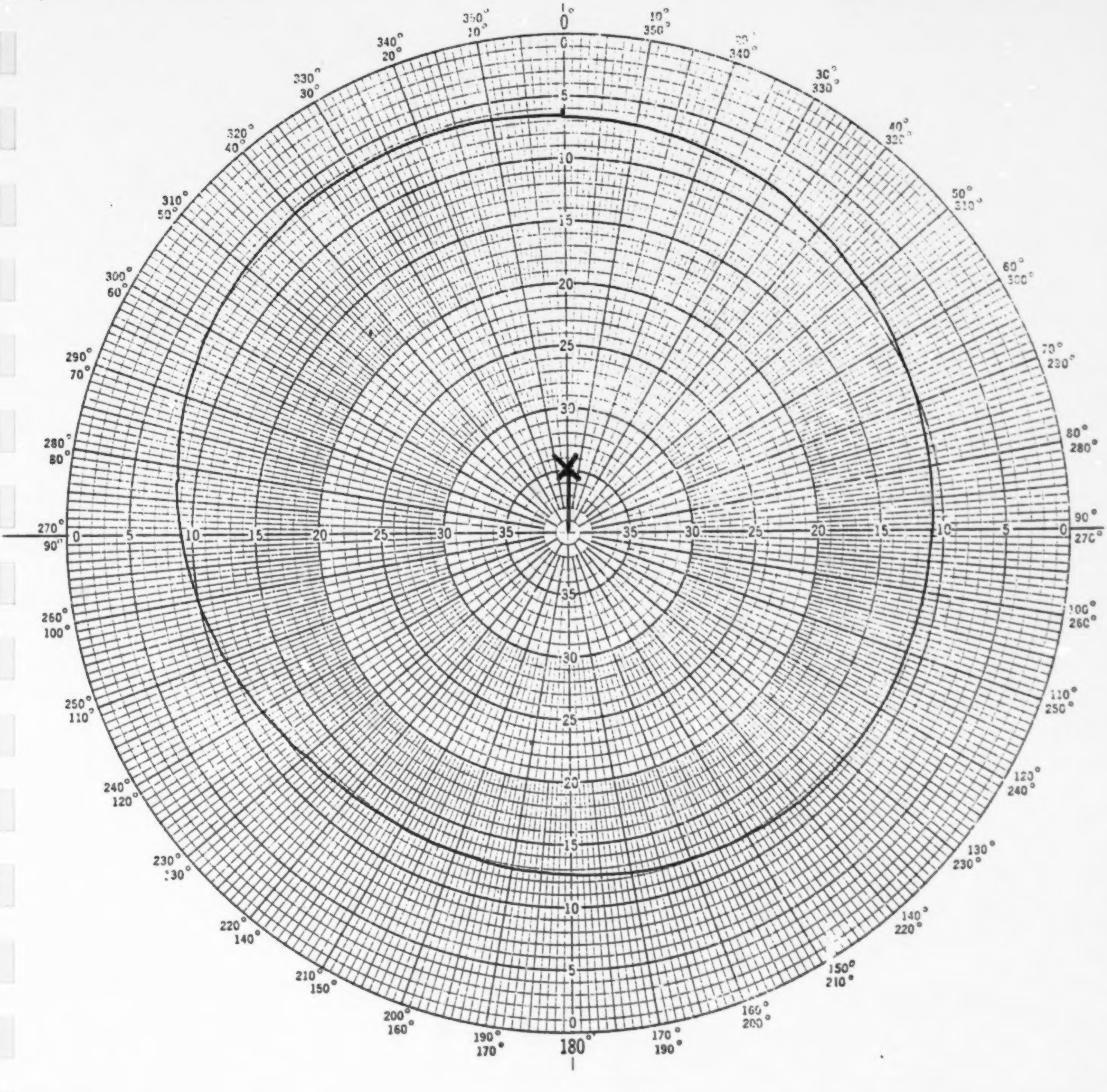
RING RADIUS: 20.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: B

PATTERN NO.: BFS3



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

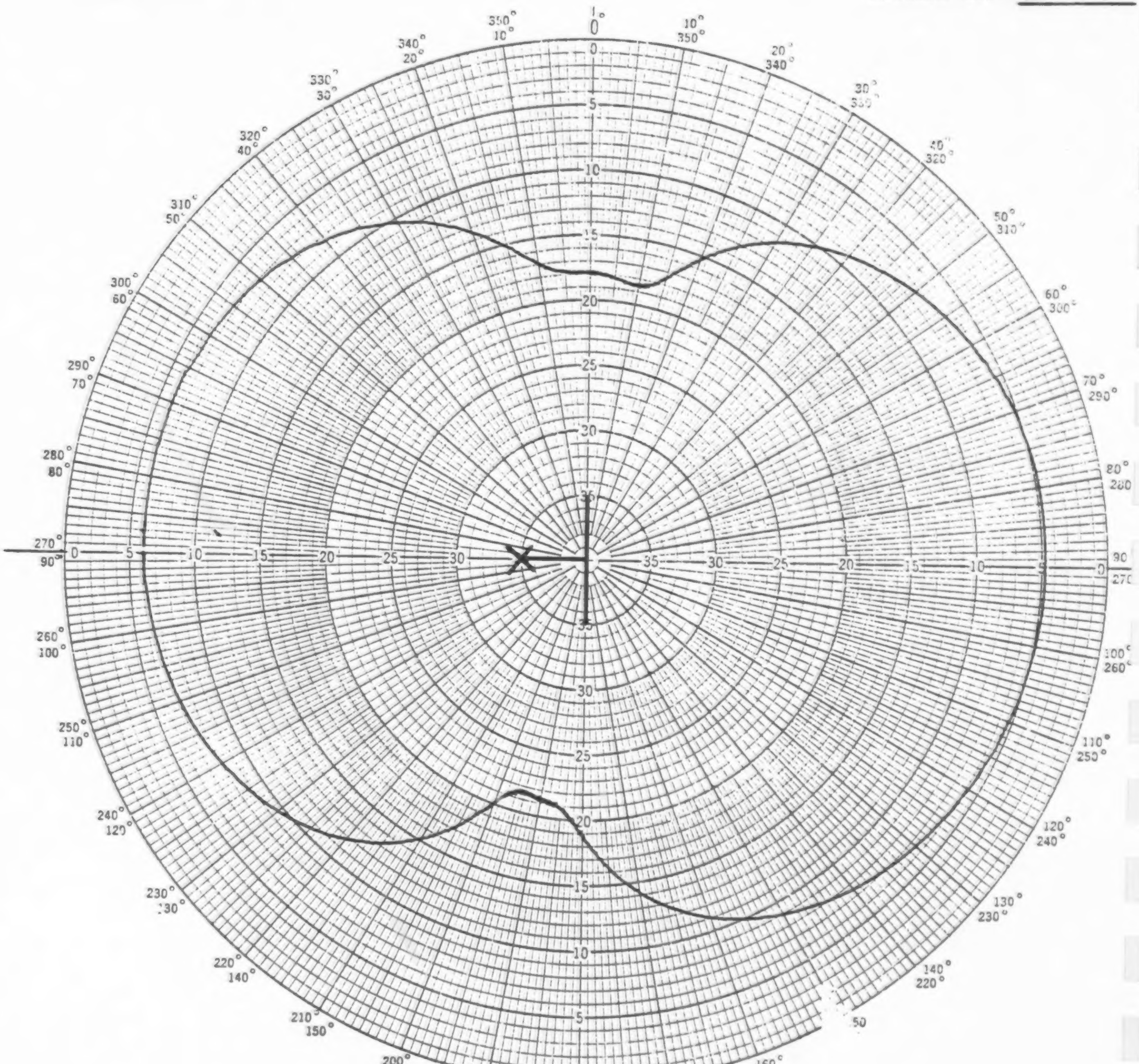
RING RADIUS: 20.5"

Micro
Communications
Inc.

DATE: 7/31/81

MODEL: B

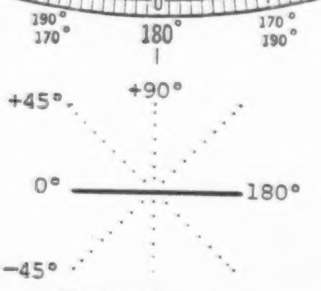
PATTERN NO.: BFS4



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

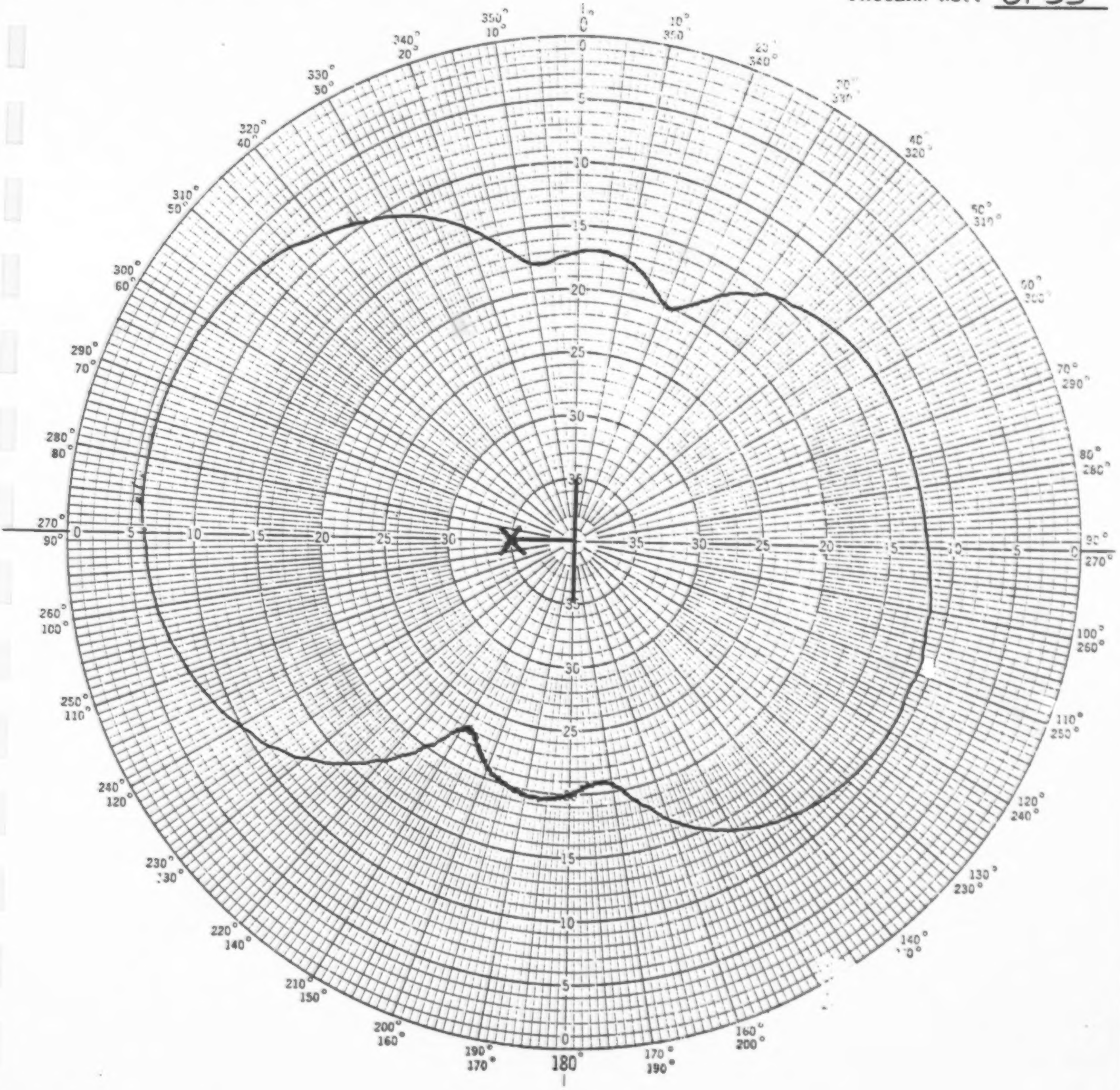
RING RADIUS: 20.5"

Micro
Communications
Inc.

DATE: 7/31/81

MODEL: B

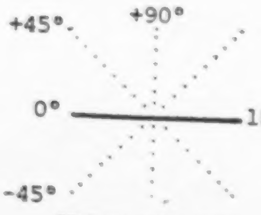
PATTERN NO.: BFS5



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

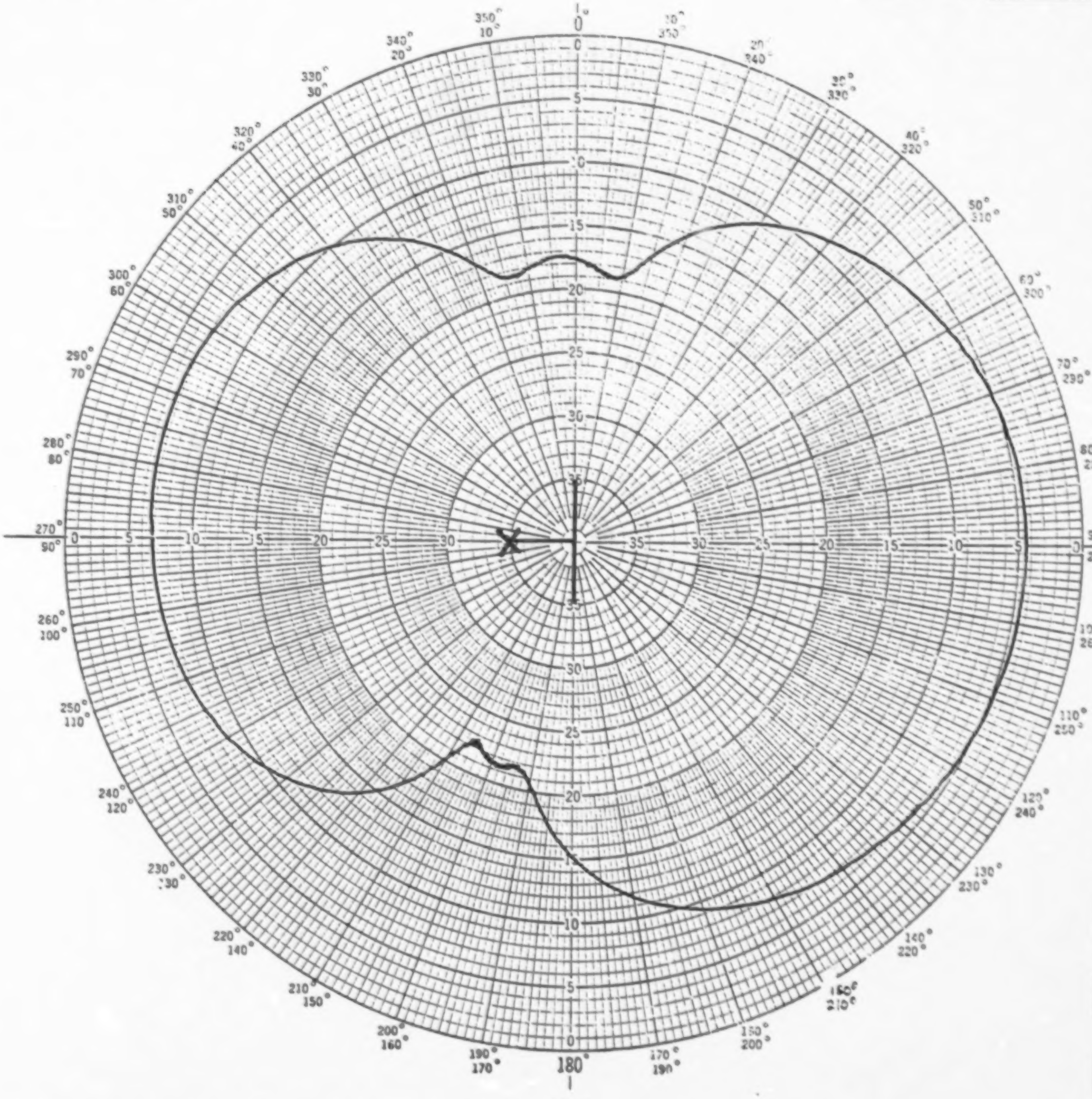
RING RADIUS: 20.5"

Micro
Communications
Inc.

DATE: 7/31/81

MODEL: B

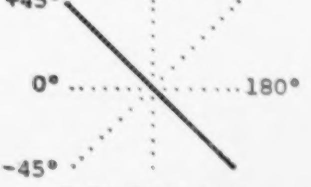
PATTERN NO.: BFS6



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

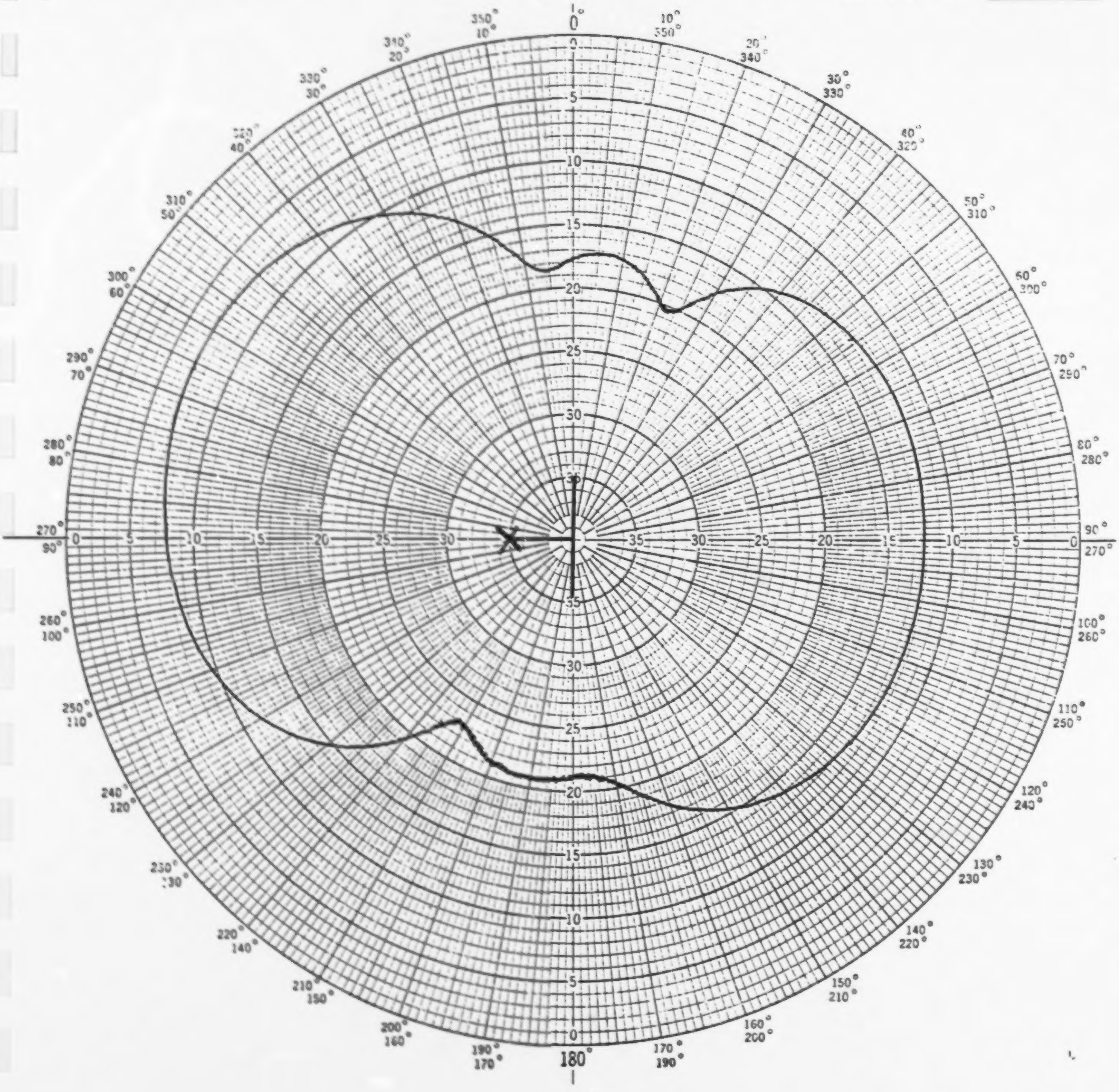
RING RADIUS: 20.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: B

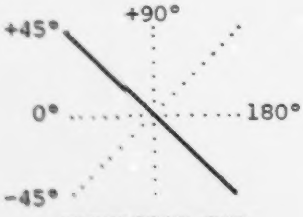
PATTERN NO.: BFS7



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

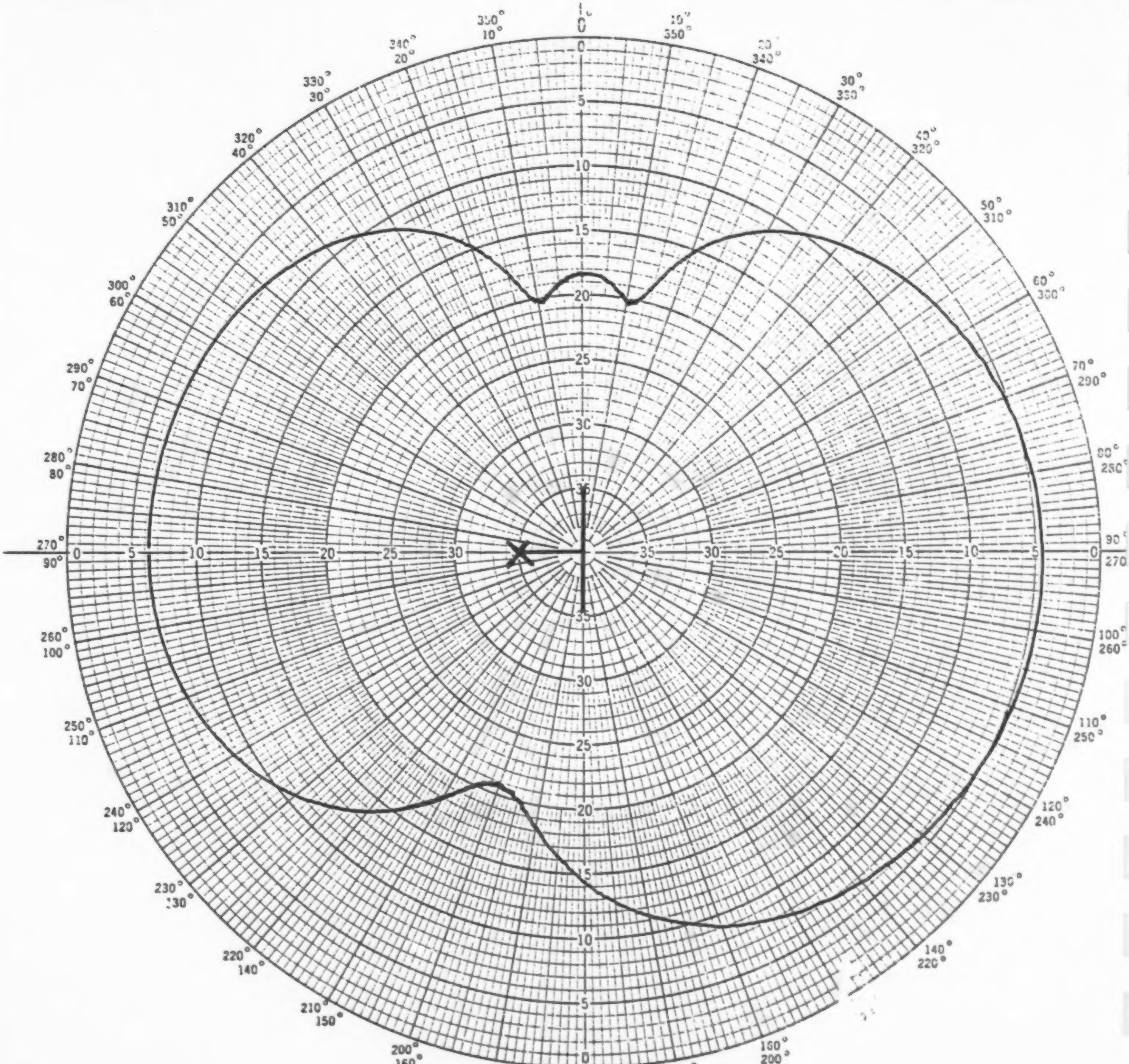
RING RADIUS: 20.5"

Micro
Communications
Inc.

DATE: 7/31/81

MODEL: B

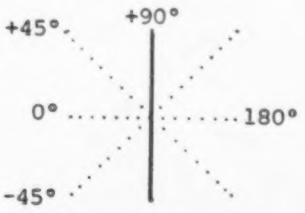
PATTERN NO.: BFS8



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

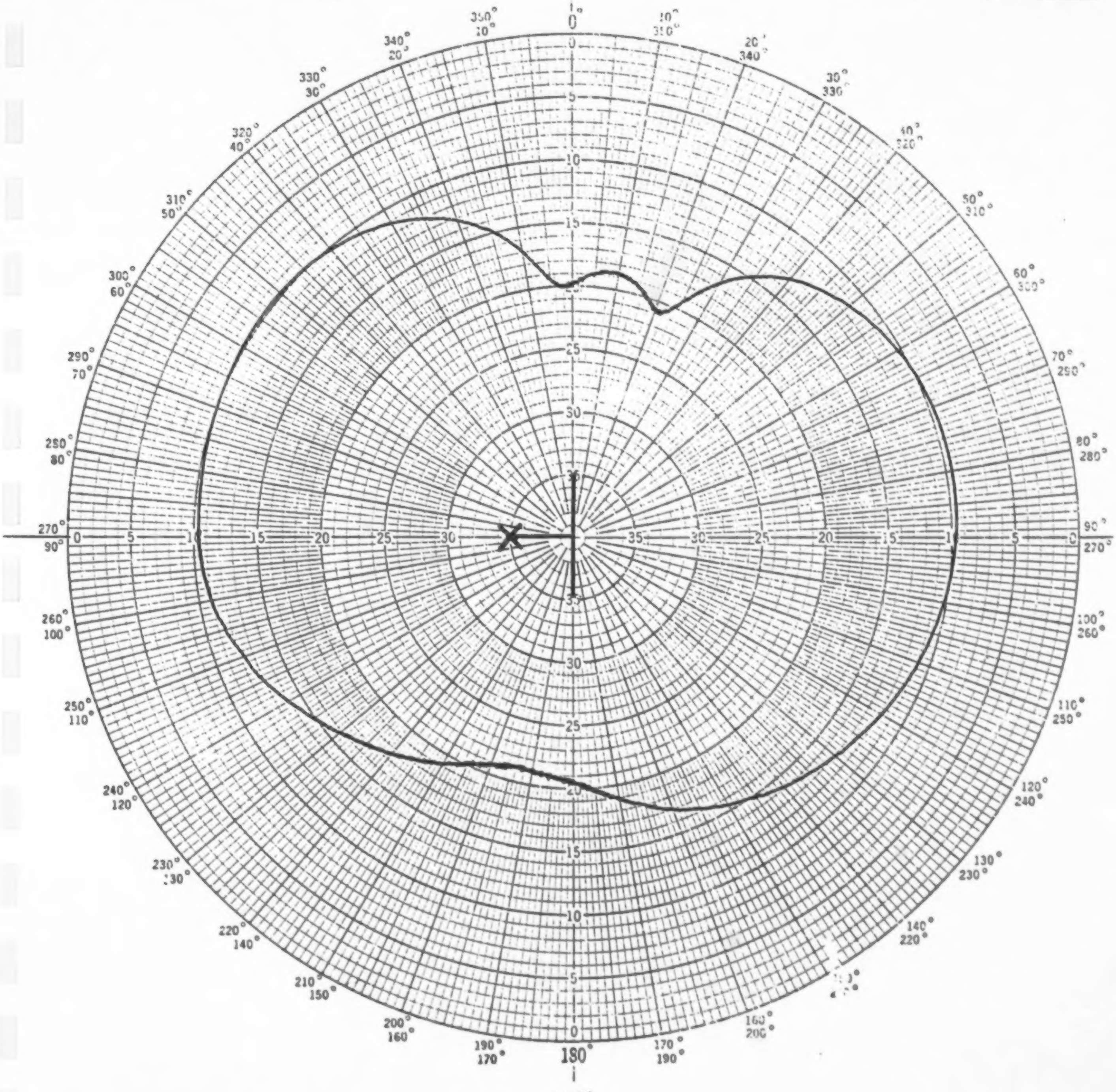
RING RADIUS: 20.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: B

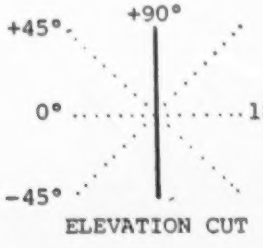
PATTERN NO.: BF59



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FREE SPACE

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

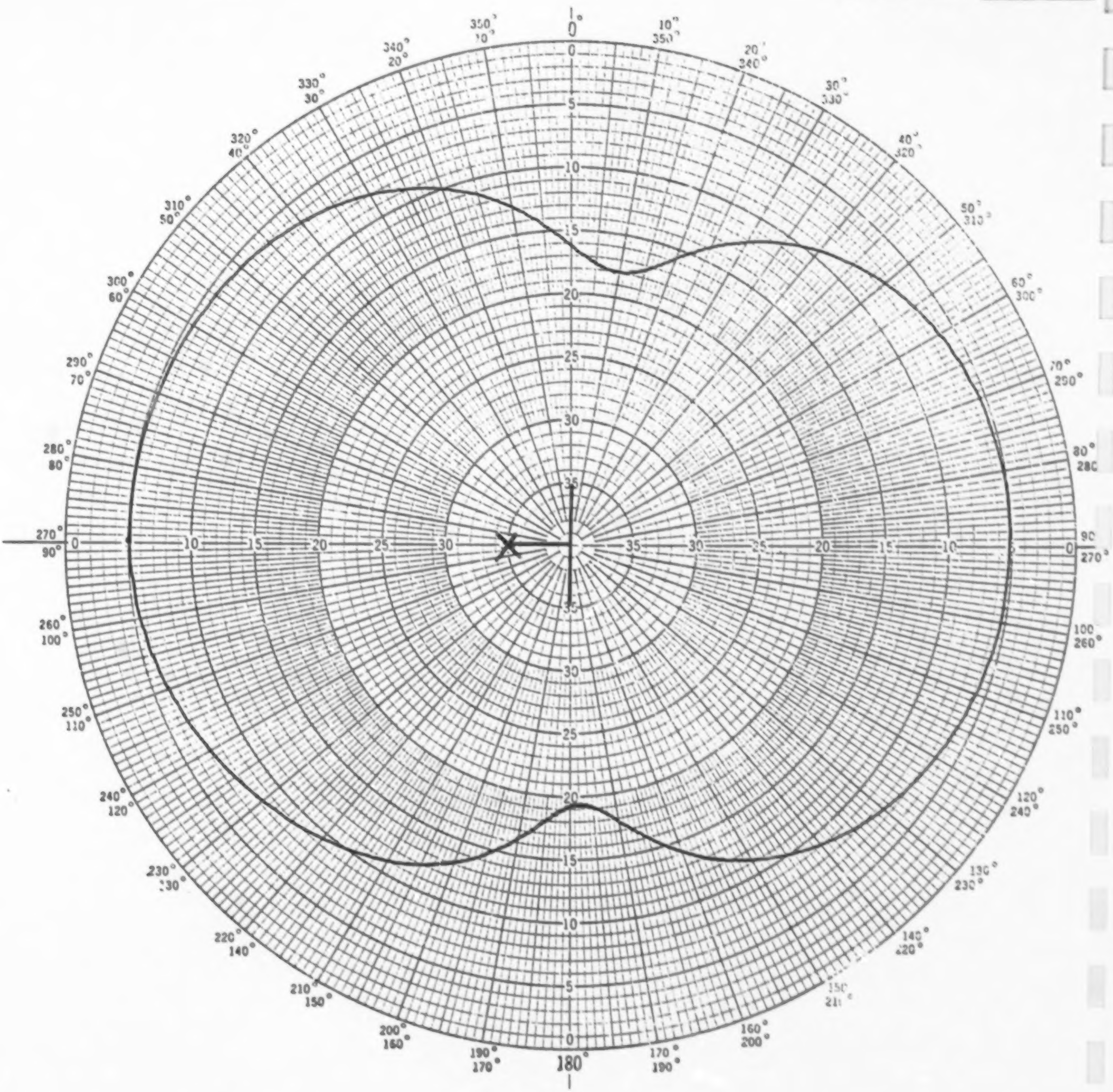
HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

RING RADIUS: 20.5"

Micro
Communications
Inc.

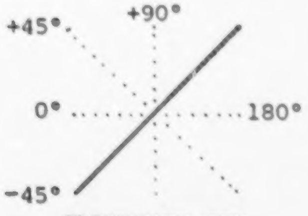
DATE: 7/31/81
MODEL: B
PATTERN NO.: BFS10



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

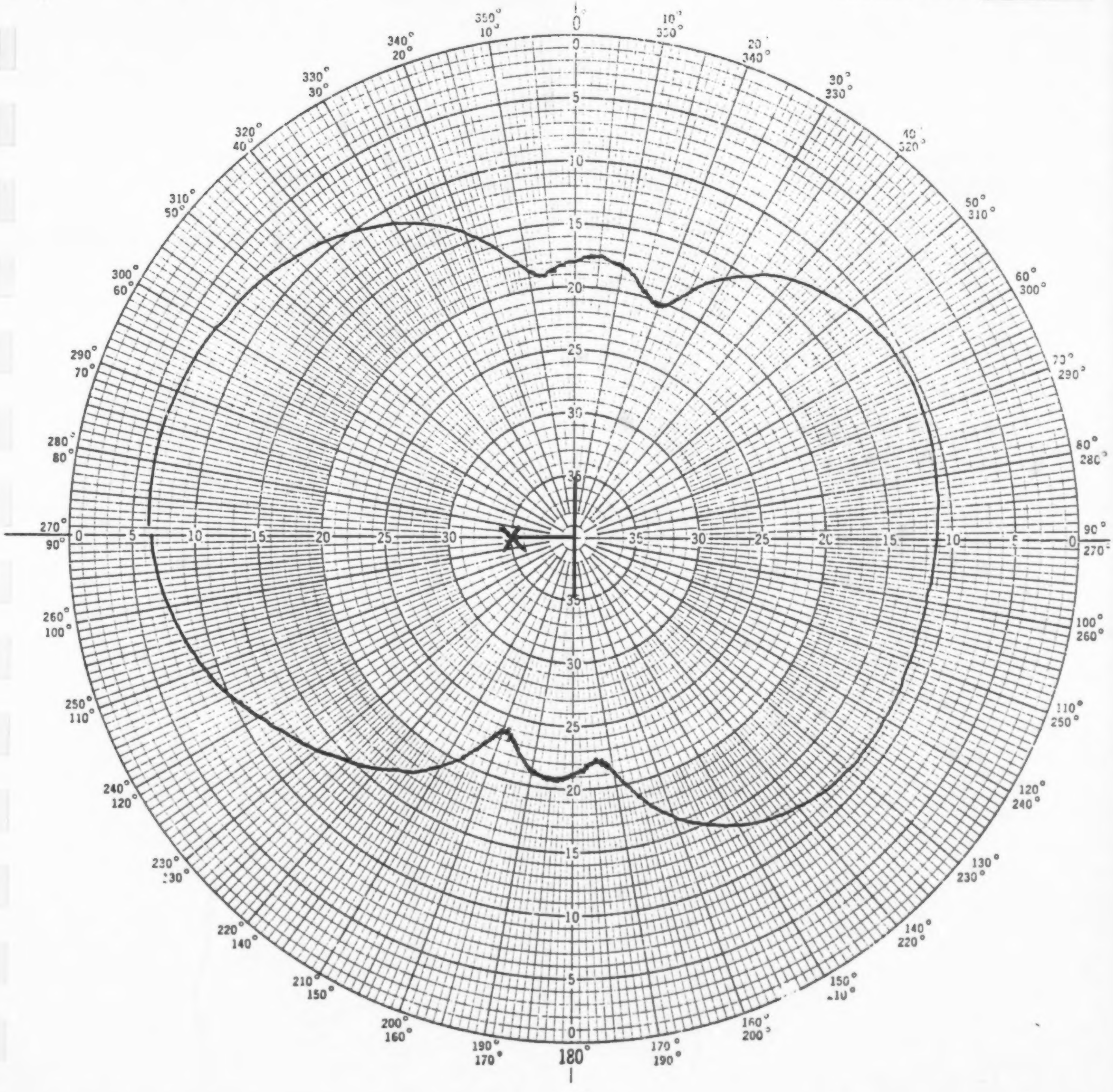
RING RADIUS: 20.5"

Micro
Communications
Inc.

DATE: 7/31/81

MODEL: B

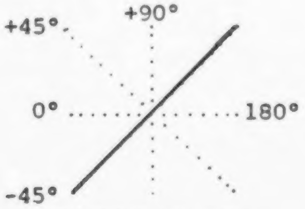
PATTERN NO.: BFS11



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FREE SPACE

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

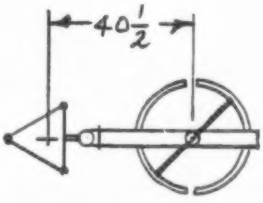
DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

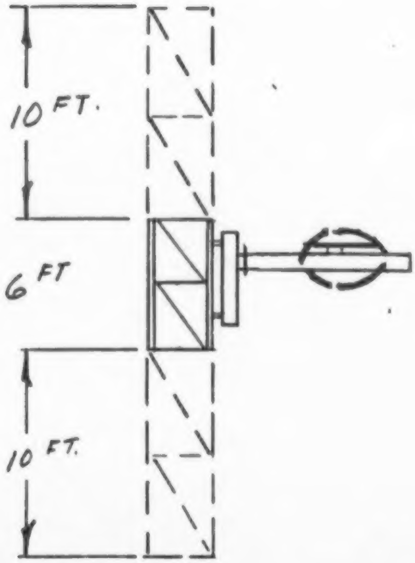
RING RADIUS: 20.5"

MODEL "B"
ANTENNA MOUNTED
ON TOWER FACE
August 3, 1981

| PATTERN NUMBER | * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLARIZATION | REMARKS |
|---|---|---|---|---|---|
| BF1 | (85) | 16.5 | Axial Ratio | | |
| BF2 | (86) | 16.5 | Aximuth | Vert. | Ant. unbalanced, gear slipped |
| BF3 | (87) | 16.5 | Azimuth | Hoz. | |
| BF4 | (88) | 16.5 | Azimuth | Vert. | |
| BF5 | (89) | 16.5 | Elevation | Hoz. | 0-180 cut |
| BF6 | (90) | 16.5 | Elevation | Vert. | 0-180 cut |
| BF7 | (91) | 16.5 | Elevation | Hoz. | +45 cut |
| BF8 | (92) | 16.5 | Elevation | Vert. | +45 cut |
| BF9 | (93) | 16.5 | Elevation | Hoz. | +90 cut |
| BF10 | (94) | 16.5 | Elevation | Vert. | +90 cut |
| BF11 | (95) | 16.5 | Elevation | Hoz. | -45 cut |
| BF12 | (96) | 16.5 | Elevation | Vert. | -45 cut |

NOTE: All data taken with tower extended 10 feet on the top side
*Page Numbers



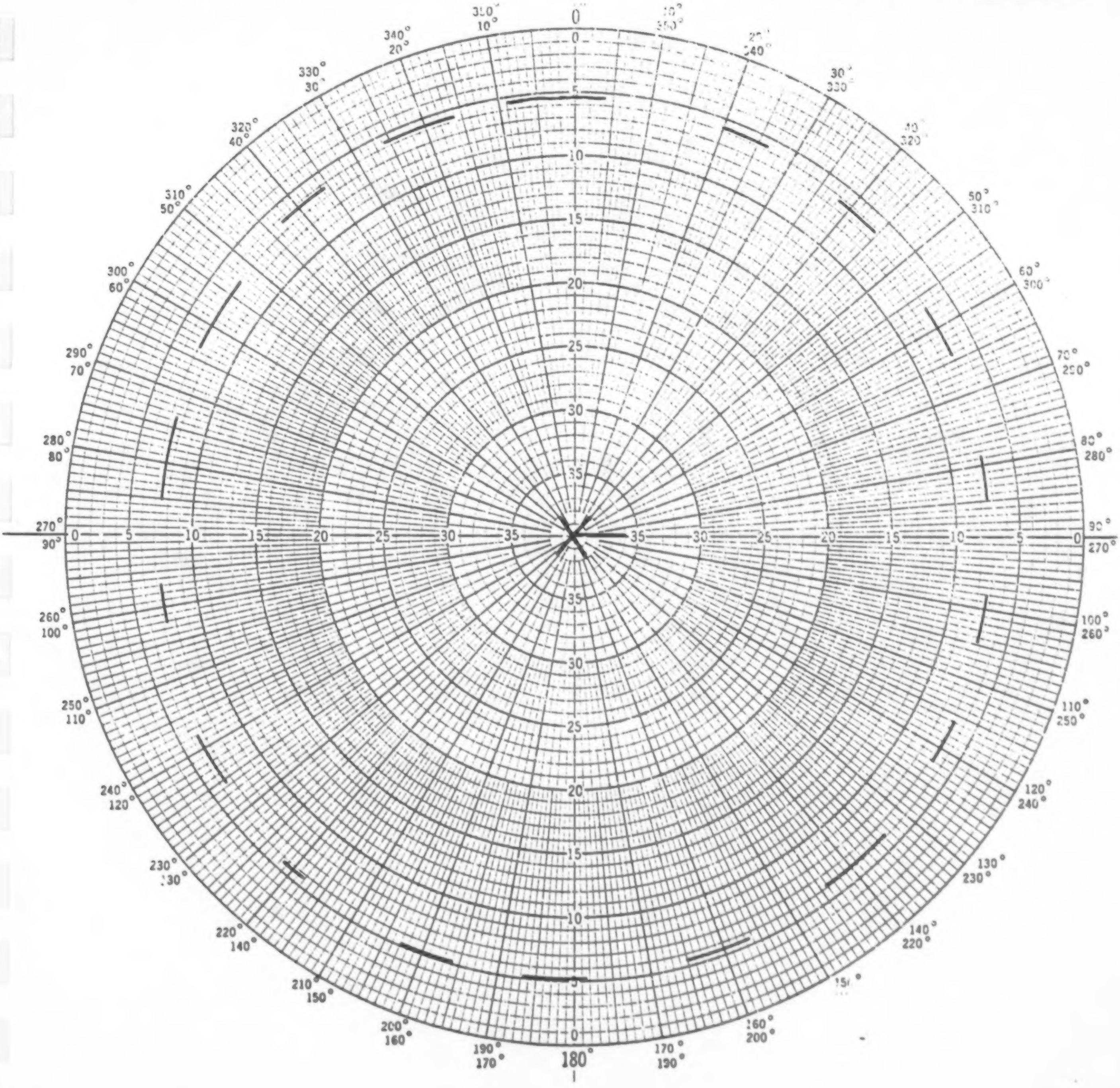


**Micro Communications Inc.**

DATE: 8/3/81

MODEL: B

PATTERN NO.: BF1



PATTERN: AXIAL RATIO

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: ______

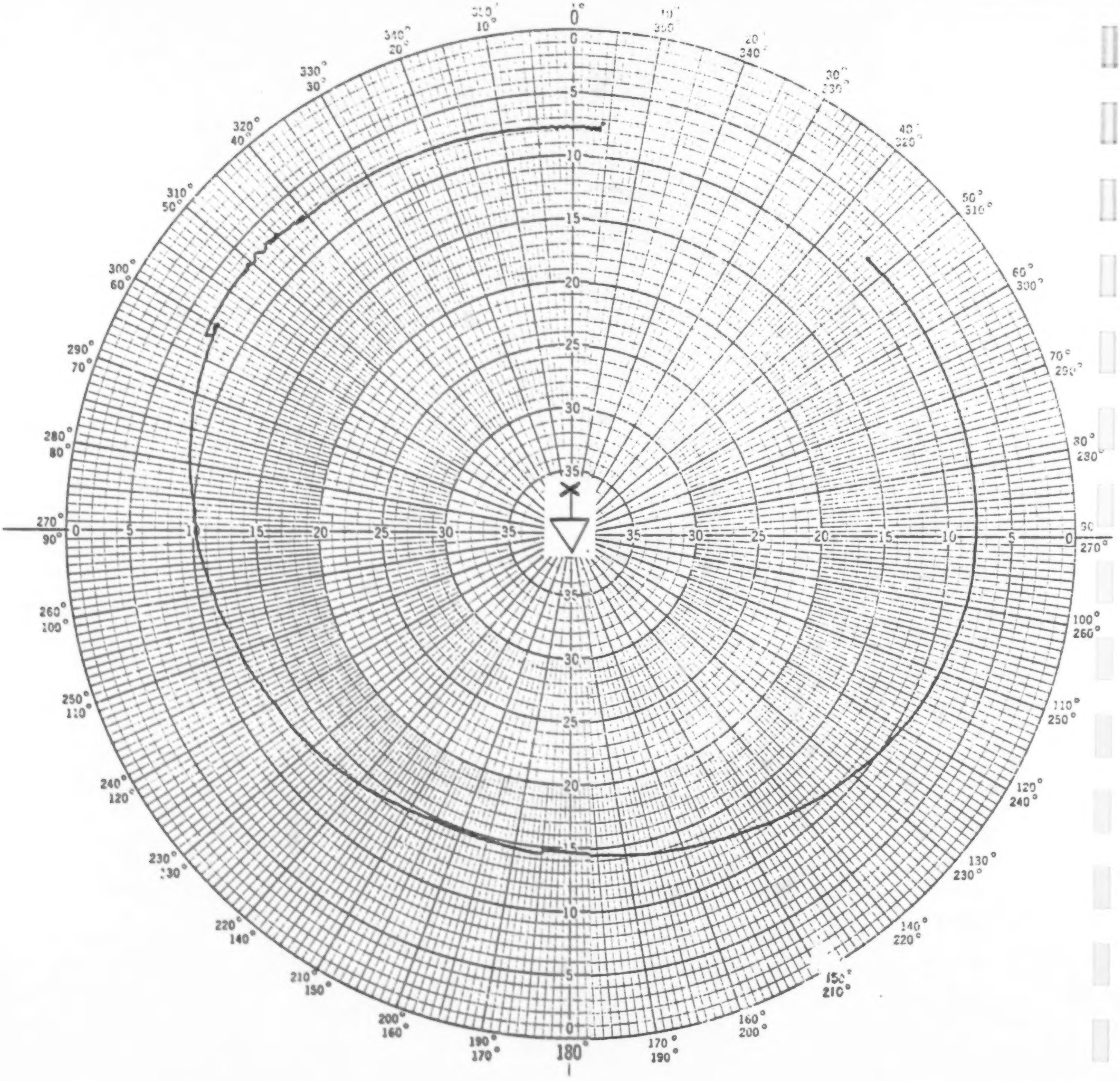
HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 40.5"

**Micro Communications Inc.**

DATE: 8/3/81
MODEL: B
PATTERN NO.: BF2



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 16.5

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

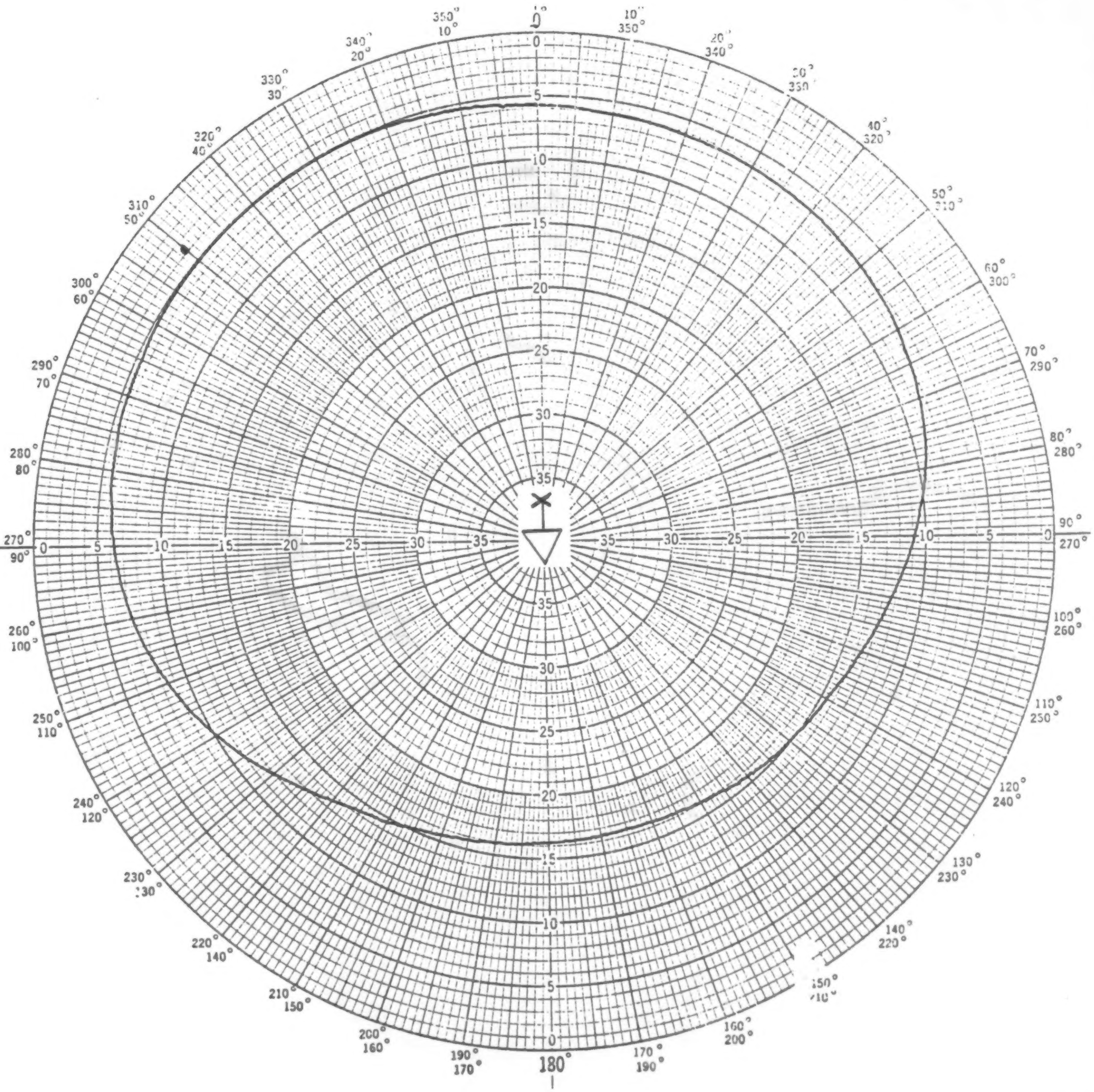
RING RADIUS: 40.5"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: B

PATTERN NO.: BF3 .



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

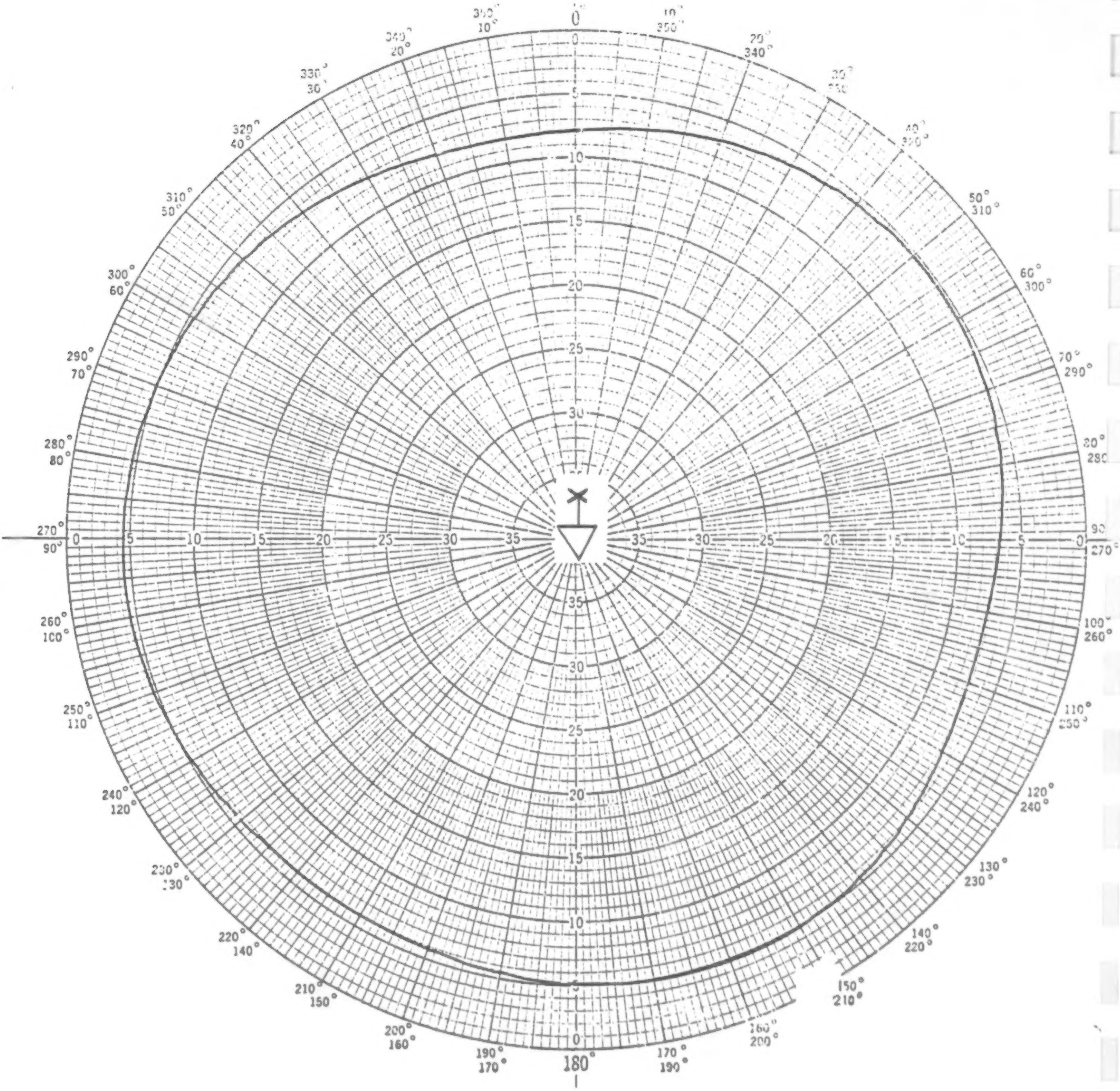
RING RADIUS: 40.5"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: B

PATTERN NO.: BF4



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

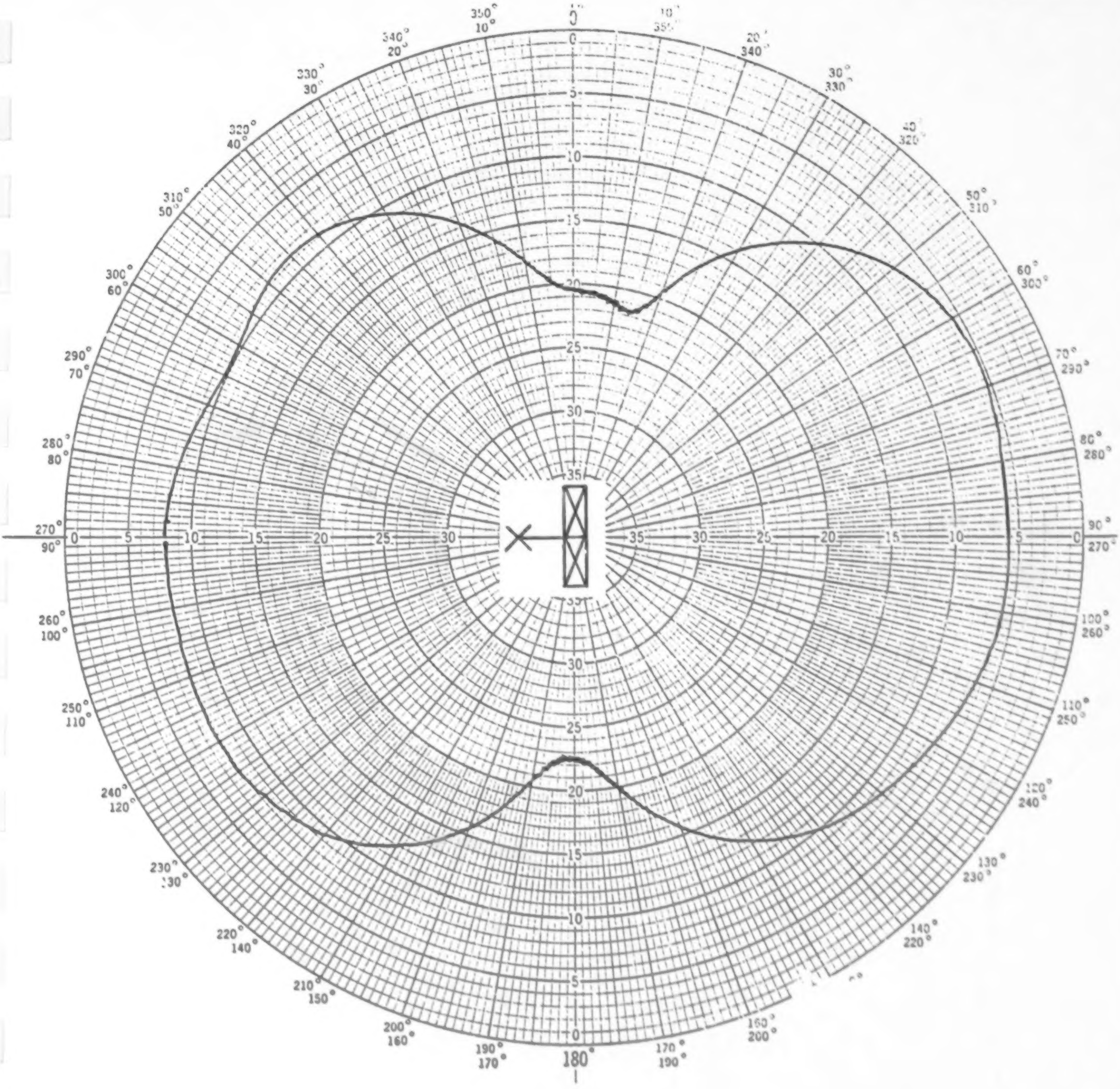
RING RADIUS: 40.5"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: B

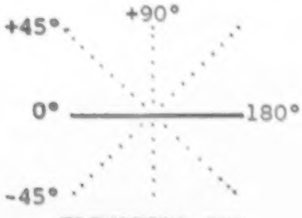
PATTERN NO.: BF5



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

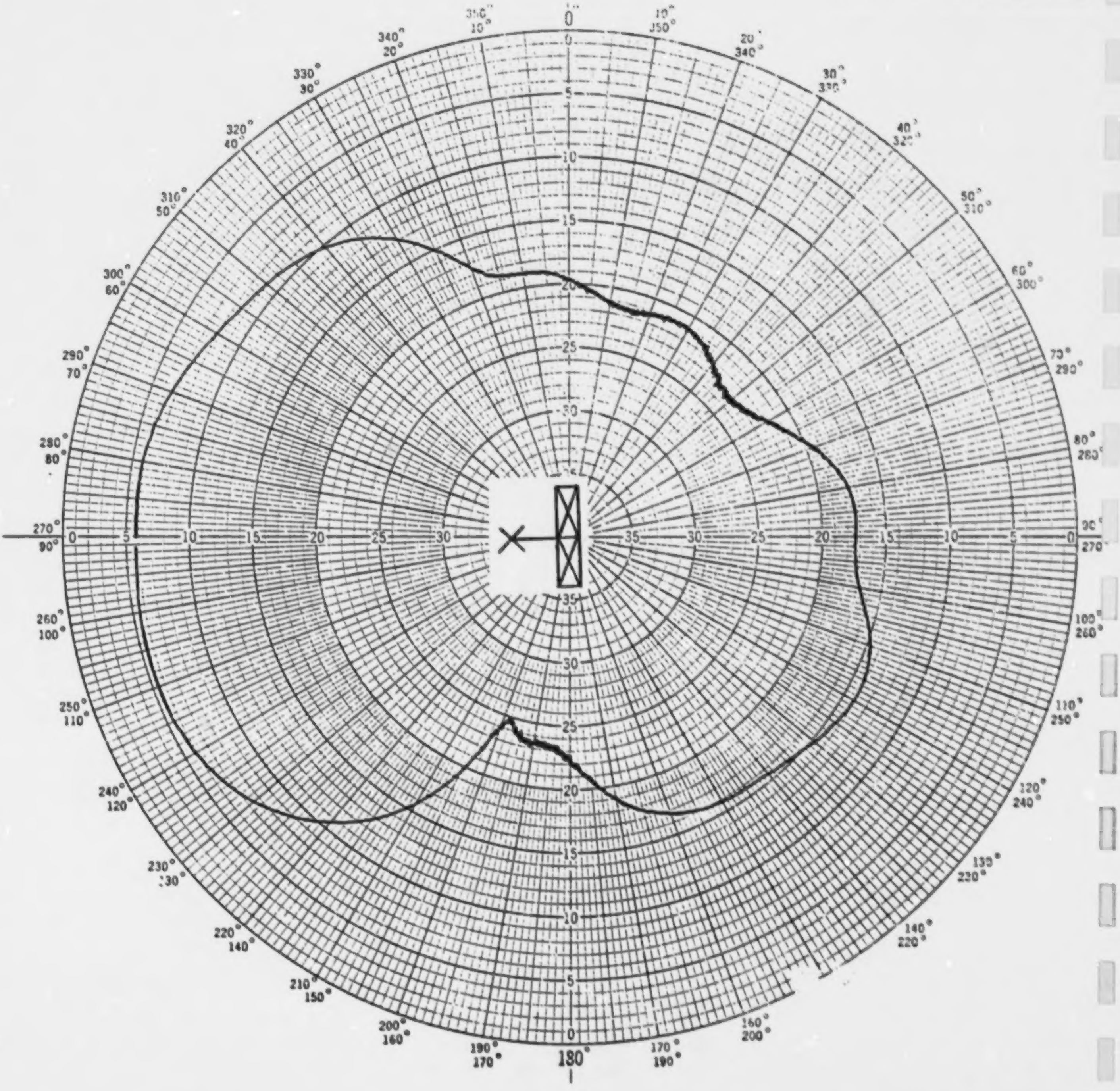
RING RADIUS: 40.5"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: B

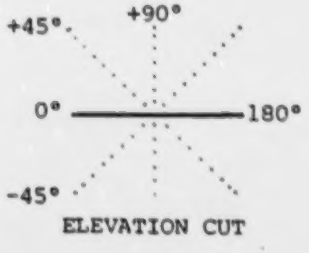
PATTERN NO.: BF6



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

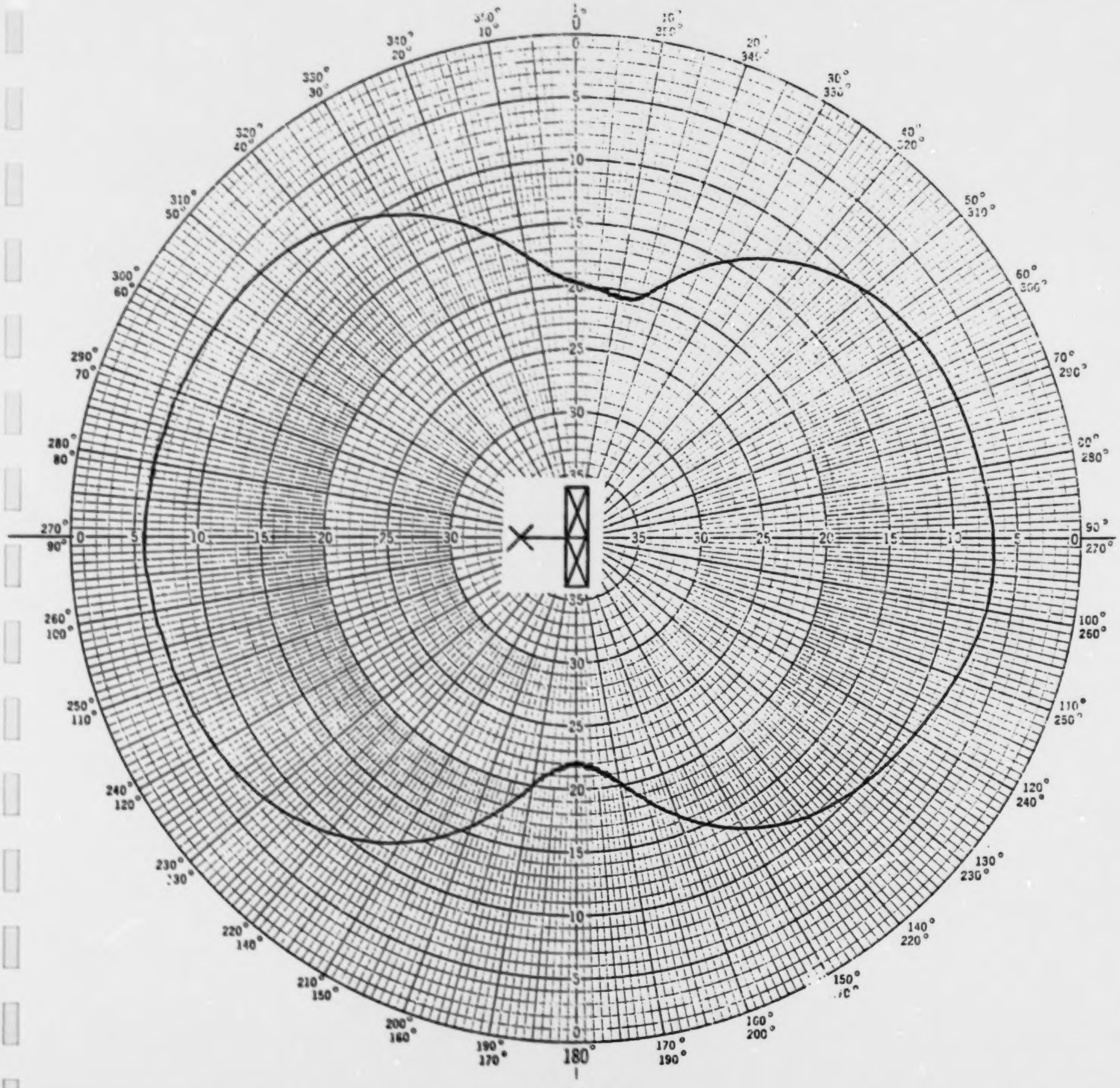
RING RADIUS: 40.5"

MCi Micro
Communications
Inc.

DATE: 8/3/81

MODEL: B

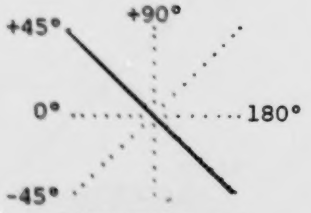
PATTERN NO.: BF7



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

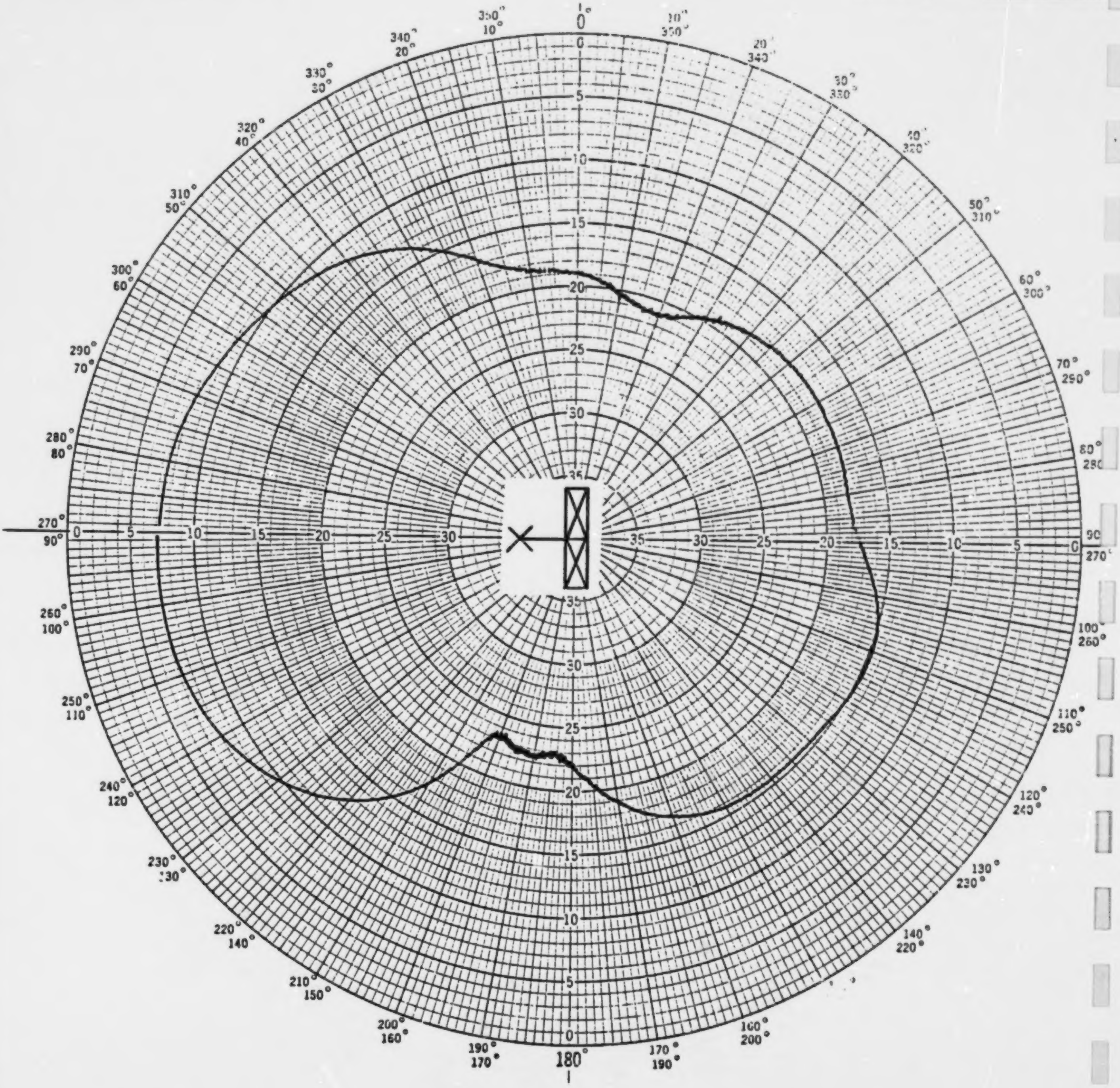
RING RADIUS: 40.5"

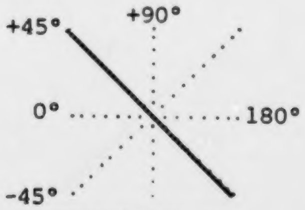
**Micro Communications Inc.**

DATE: 8/3/81

MODEL: B

PATTERN NO.: BF8





ELEVATION CUT

PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: VERT.

HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

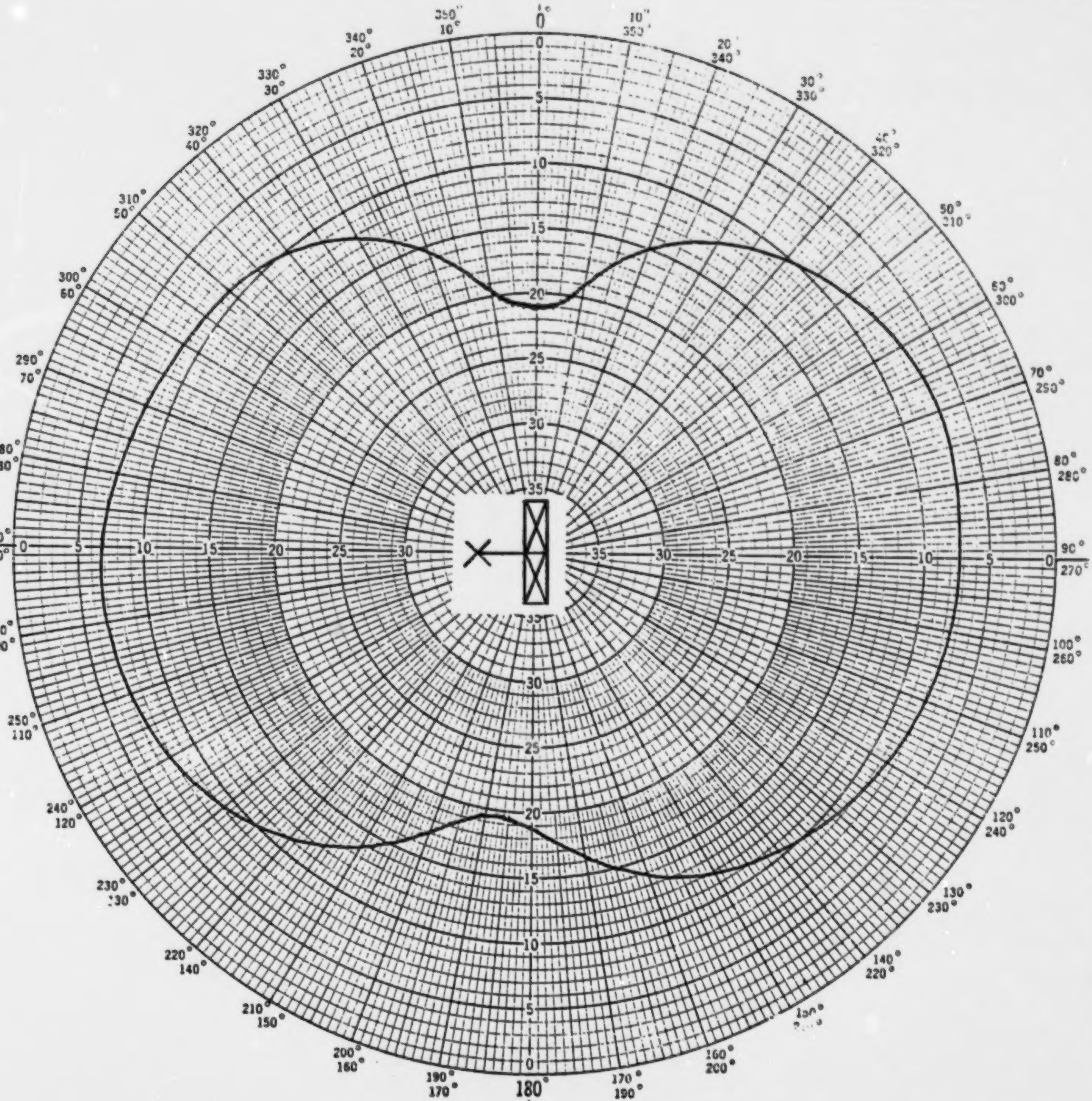
RING RADIUS: 40.5"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: B

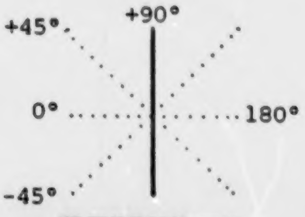
PATTERN NO.: BF9



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

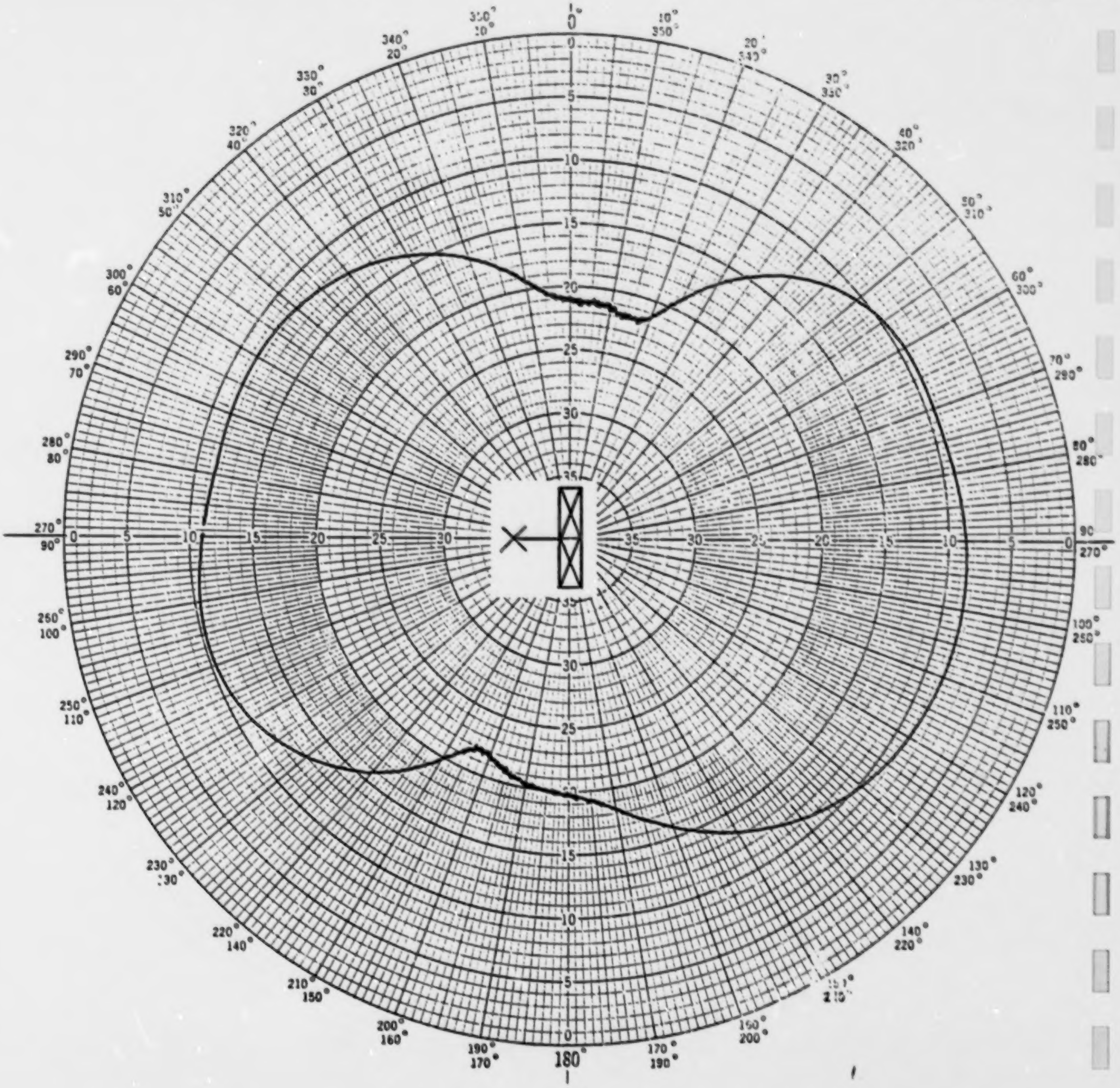
RING RADIUS: 40.5"

Micro
Communications
Inc.

DATE: 8/3/81

MODEL: B

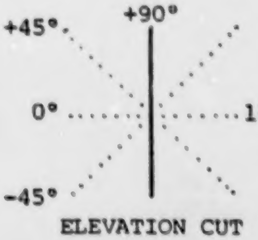
PATTERN NO.: BF10



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

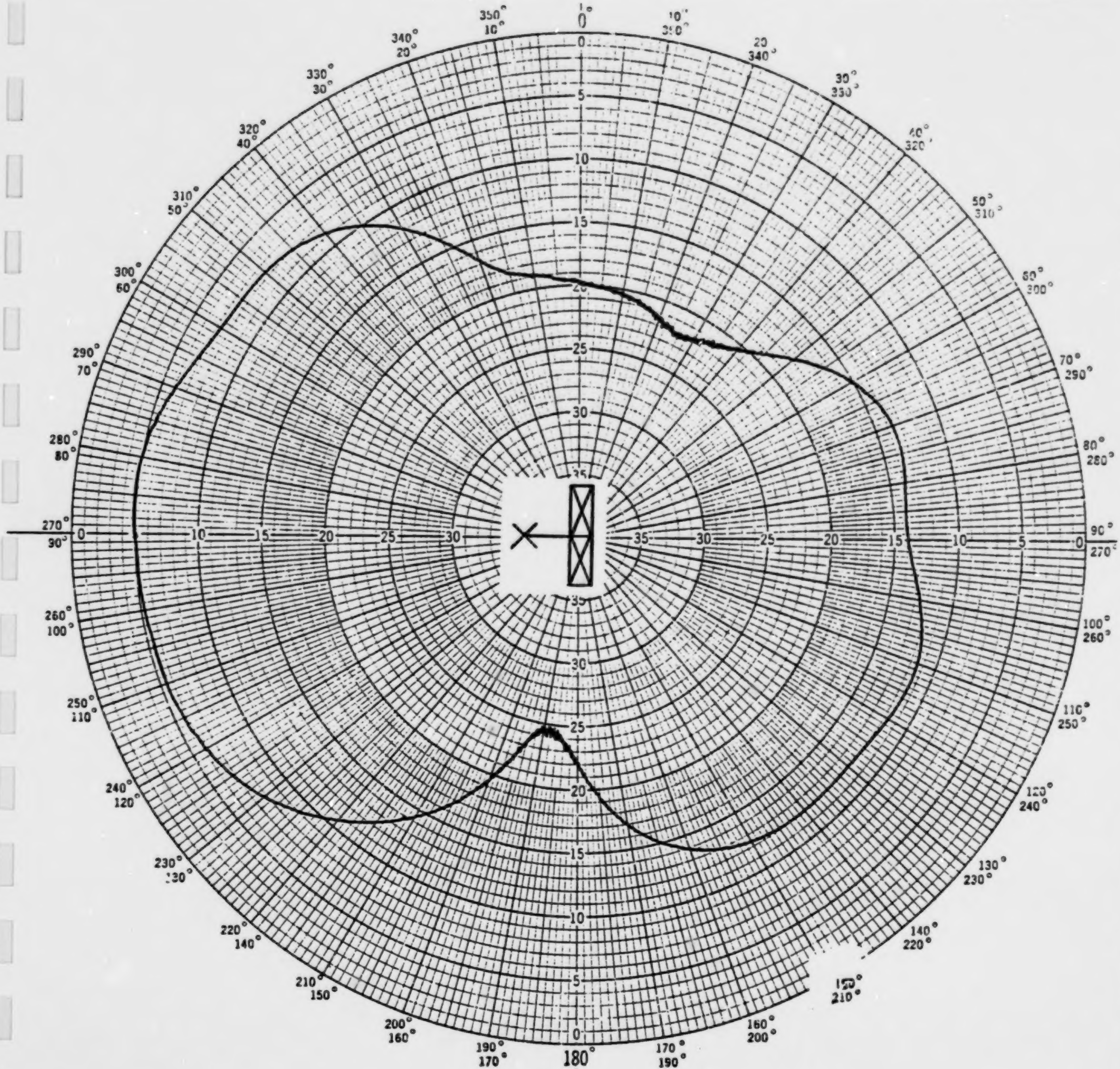
RING RADIUS: 40.5"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: B

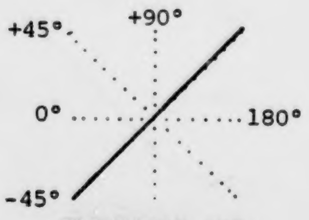
PATTERN NO.: BF11



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

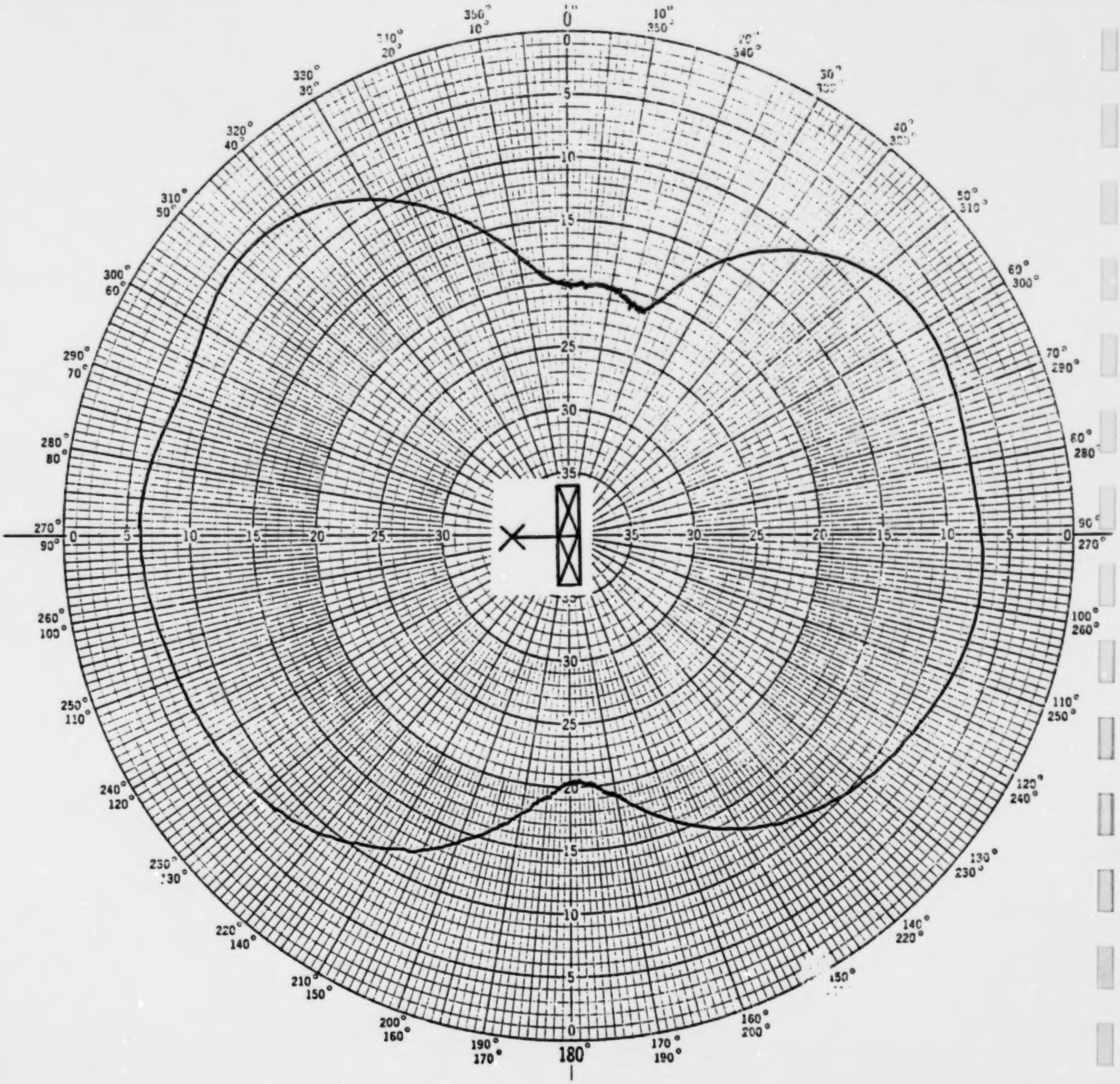
RING RADIUS: 40.5"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: B

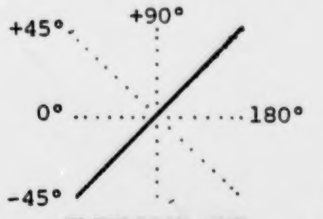
PATTERN NO.: BF12



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

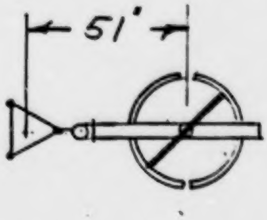
RING RADIUS: 40.5"

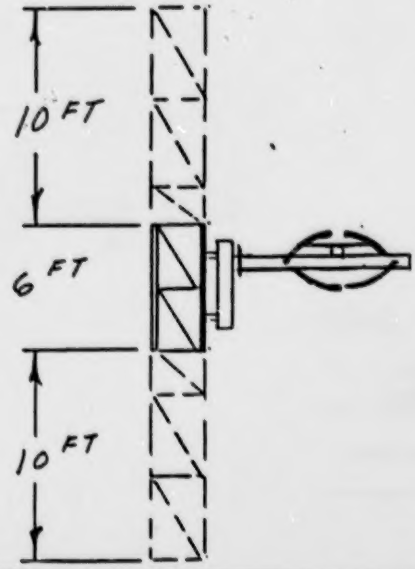
MODEL "B"
ANTENNA MOUNTED
ON TOWER LEG
August 5, 1981

| PATTERN NUMBER * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLAR-IZATION | REMARKS |
|---|---|---|---|---|
| BL1 (98) | 16.5 | Axial Ratio | | |
| BL2 (99) | 16.5 | Azimuth | Hoz. | |
| BL3 (100) | 16.5 | Azimuth | Vert. | |
| BL4 (101) | 16.5 | Elevation | Hoz. | 0-180 cut |
| BL5 (102) | 16.5 | Elevation | Vert. | 0-180 cut |
| BL6 (103) | 16.5 | Elevation | Hoz. | +45 cut |
| BL7 (104) | 16.5 | Elevation | Vert. | +45 cut |
| BL8 (105) | 16.5 | Elevation | Hoz. | +90 cut |
| BL9 (106) | 16.5 | Elevation | Vert. | +90 cut |
| BL10 (107) | 16.5 | Elevation | Hoz. | -45 cut |
| BL11 (108) | 16.5 | Elevation | Vert. | -45 cut |
| BL12 (109) | 18.5 | Elevation | Hoz. | 0-180, tower extended to 26' |
| BL13 (110) | 16.5 | Elevation | Hoz. | 0-180, tower extended to 26' |
| BL14 (111) | 16.5 | Elevation | Vert. | 0-180, tower extended to 26' |

NOTE: All data taken with tower extended 10 feet on the top side except BL12, BL13 and BL14 which are extended on the top and bottom side.

*Page Numbers



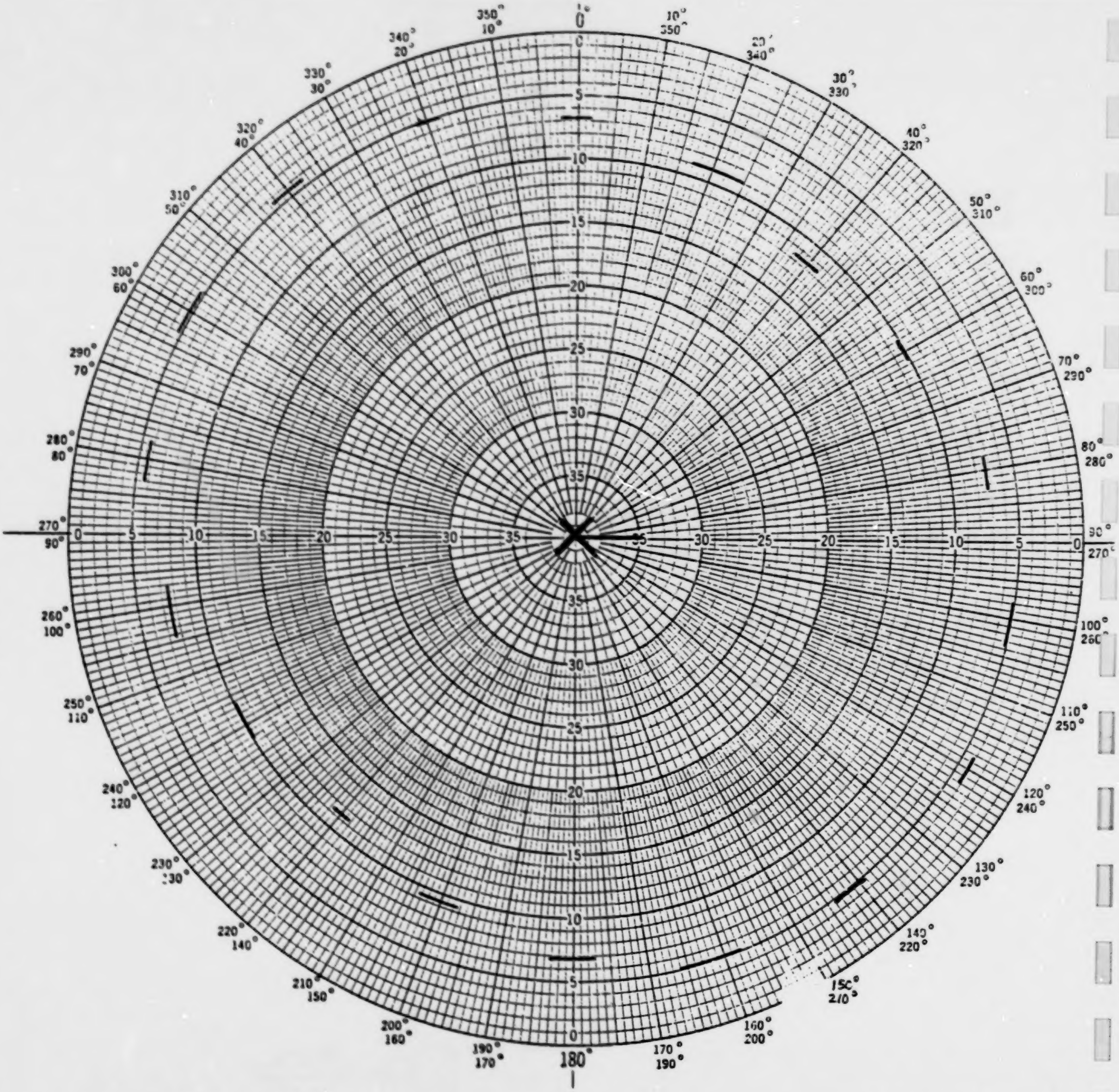


**Micro Communications Inc.**

DATE: 8/5/81

MODEL: B

PATTERN NO.: BL1



PATTERN: AXIAL RATIO

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: ______

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

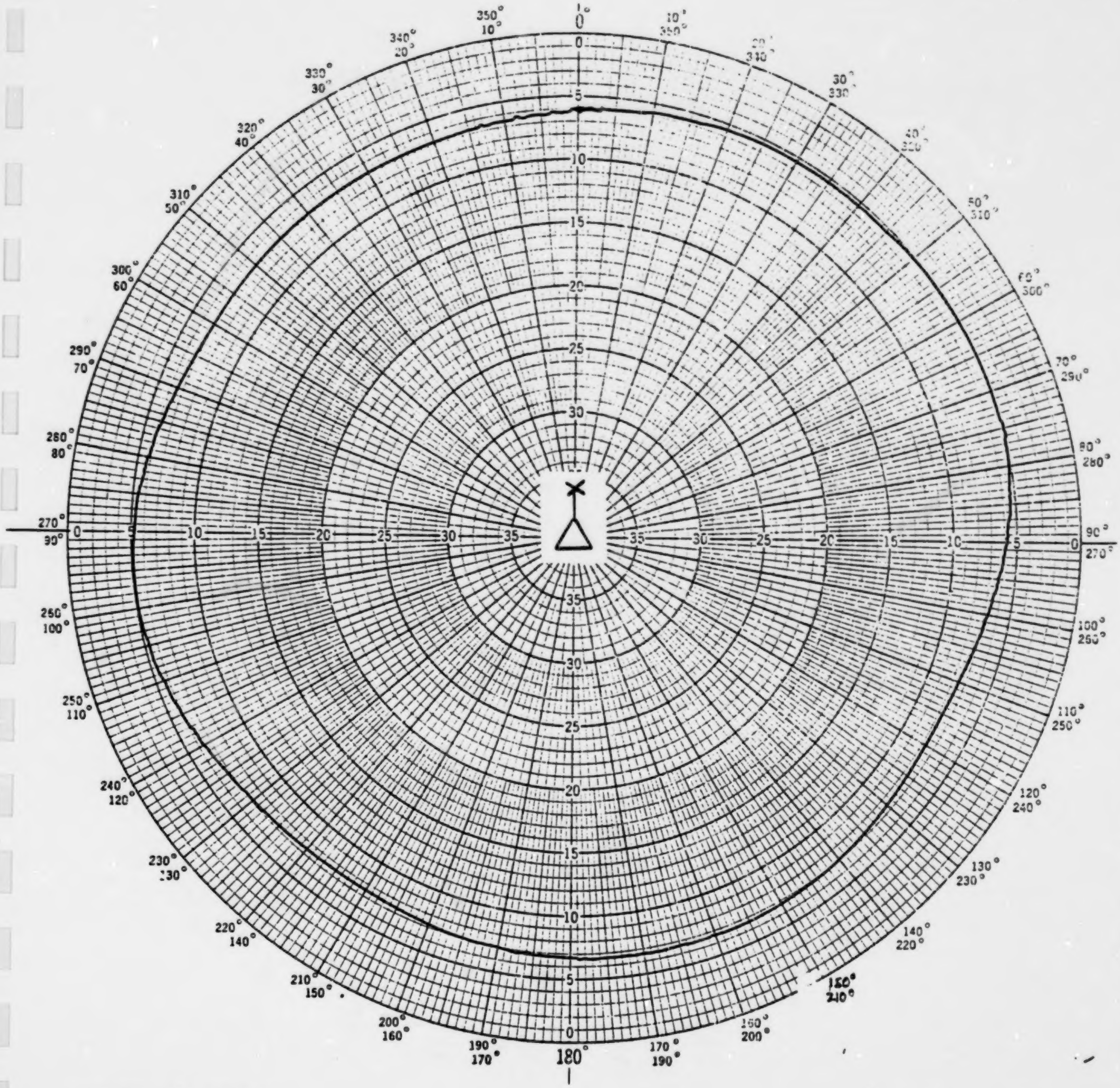
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: B

PATTERN NO.: BL2



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT

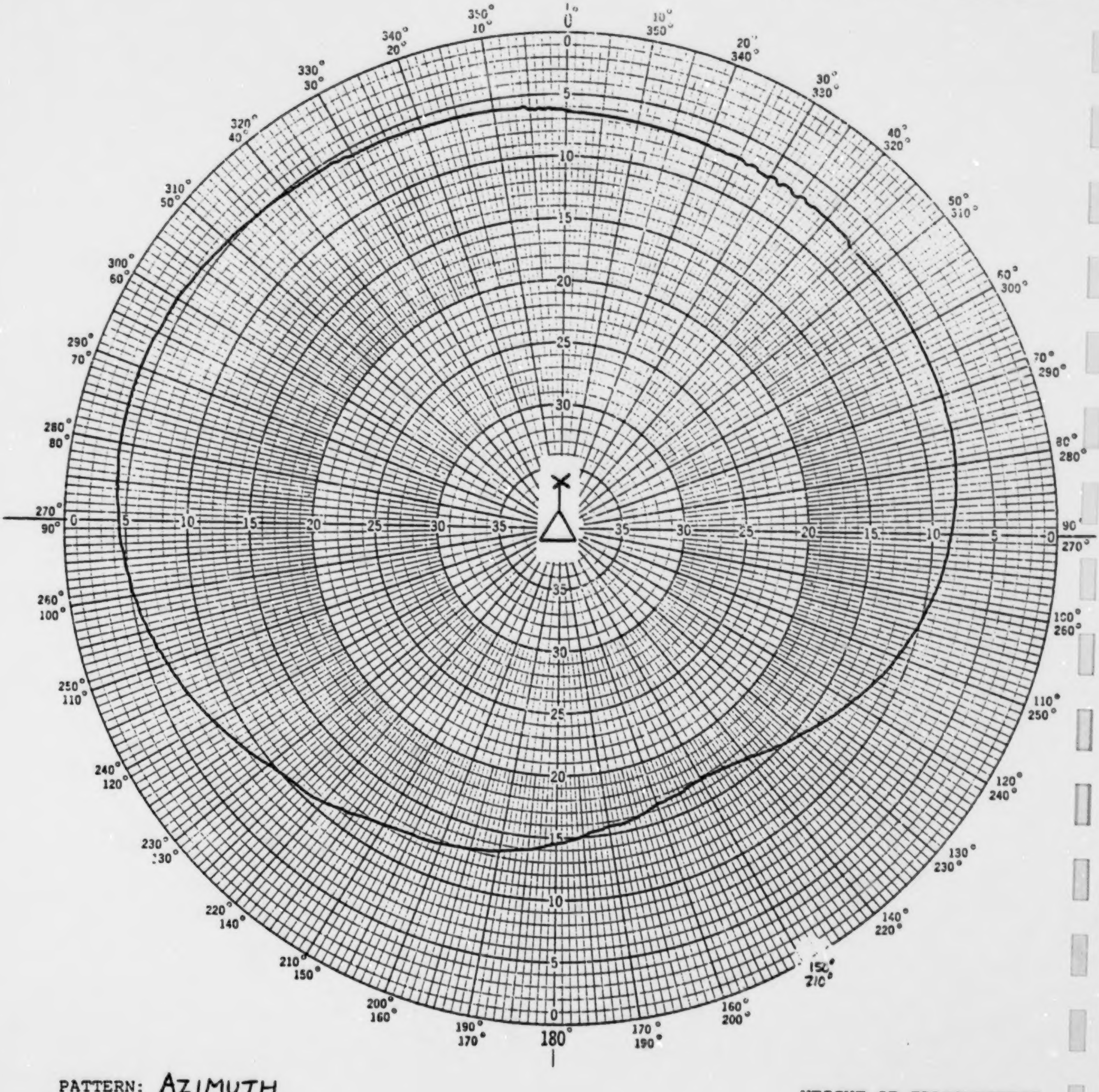
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: B

PATTERN NO.: BL3



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

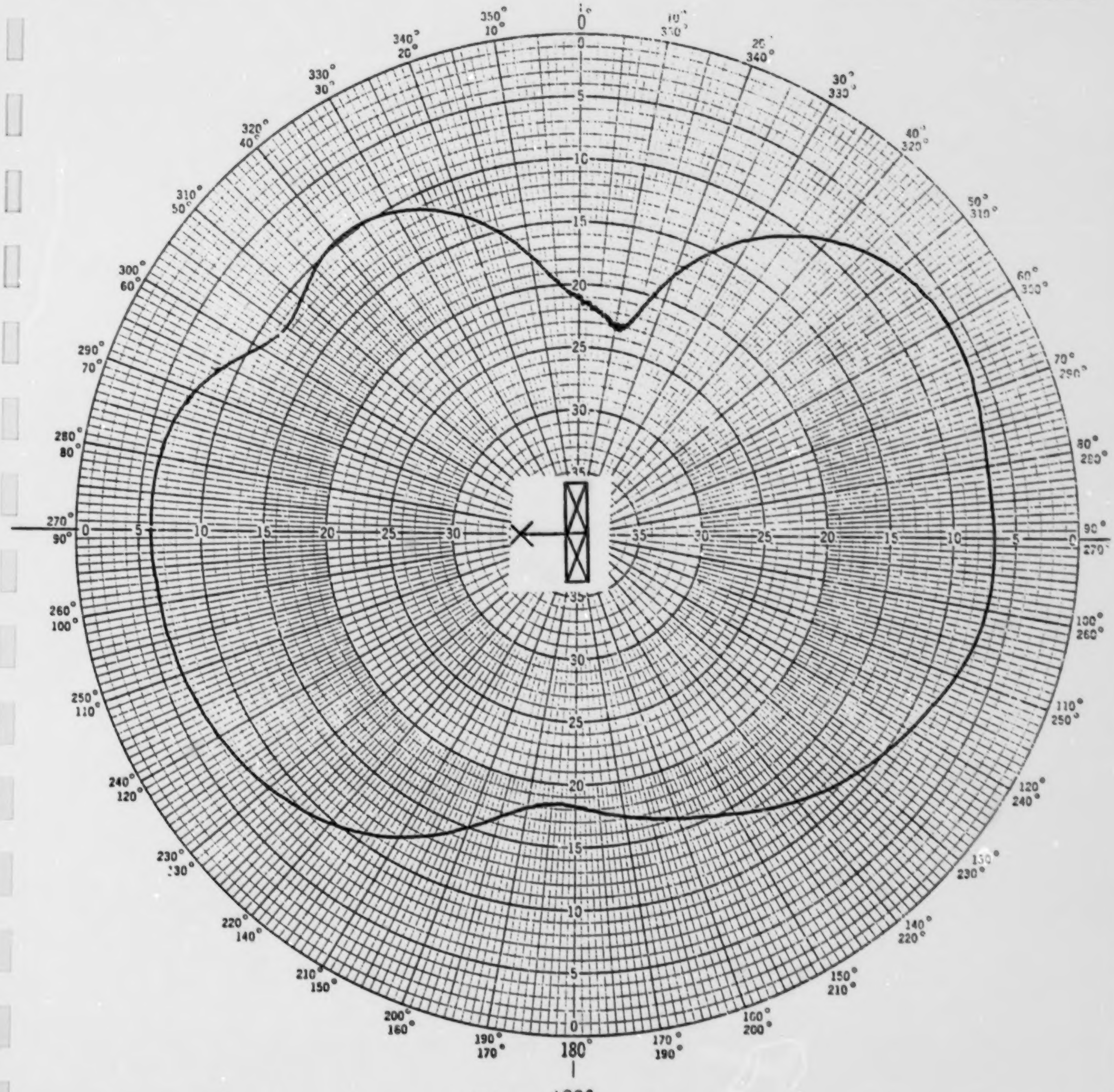
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: B

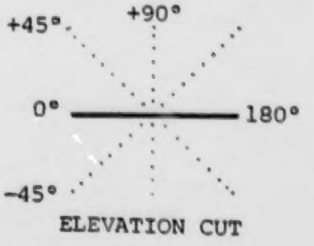
PATTERN NO.: BL4



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

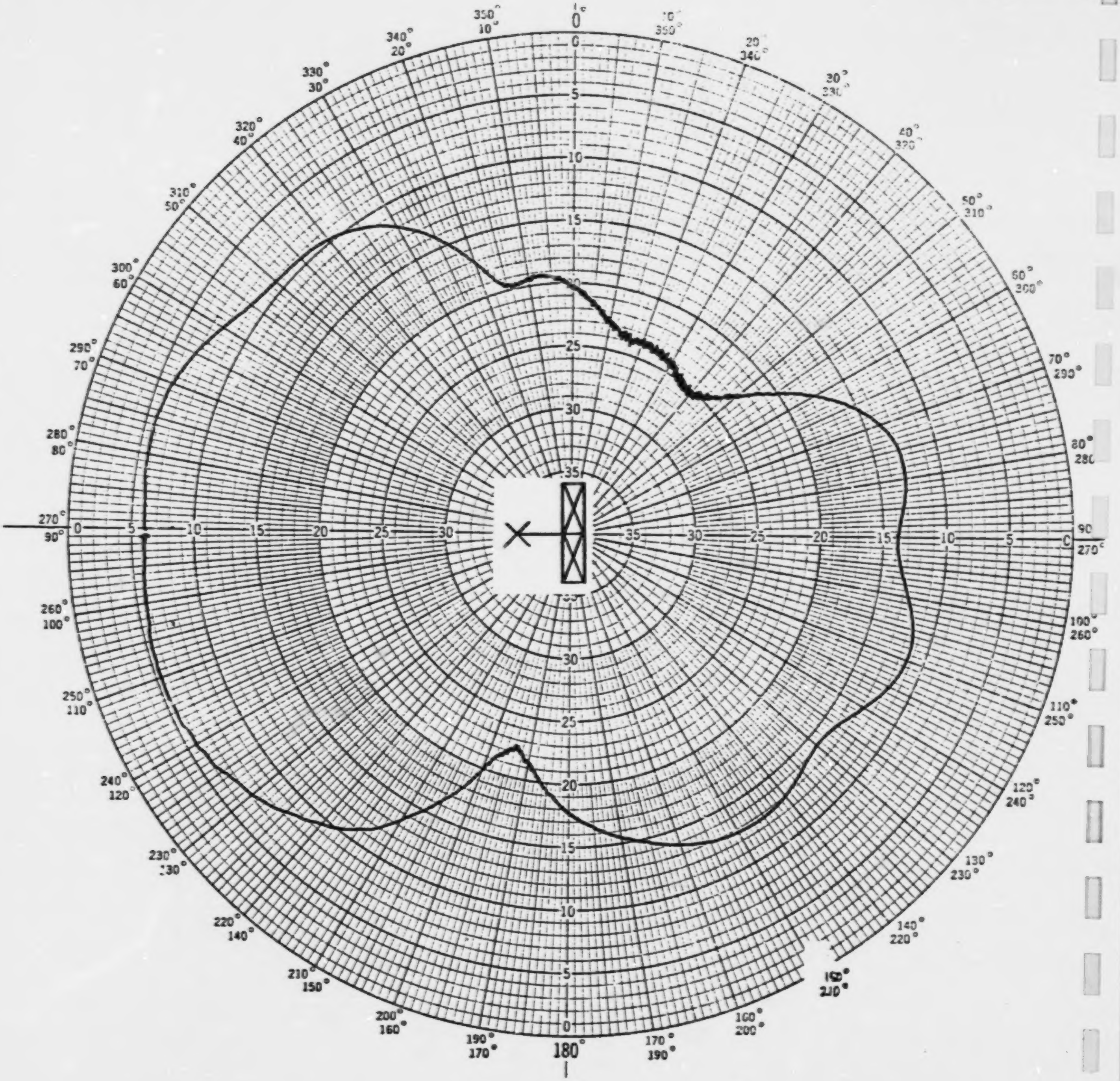
RING RADIUS: 51"

Micro
Communications
Inc.

DATE: 8/5/81

MODEL: B

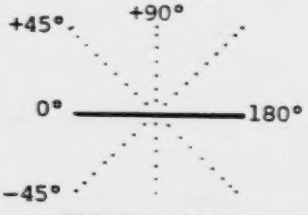
PATTERN NO.: BL5



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

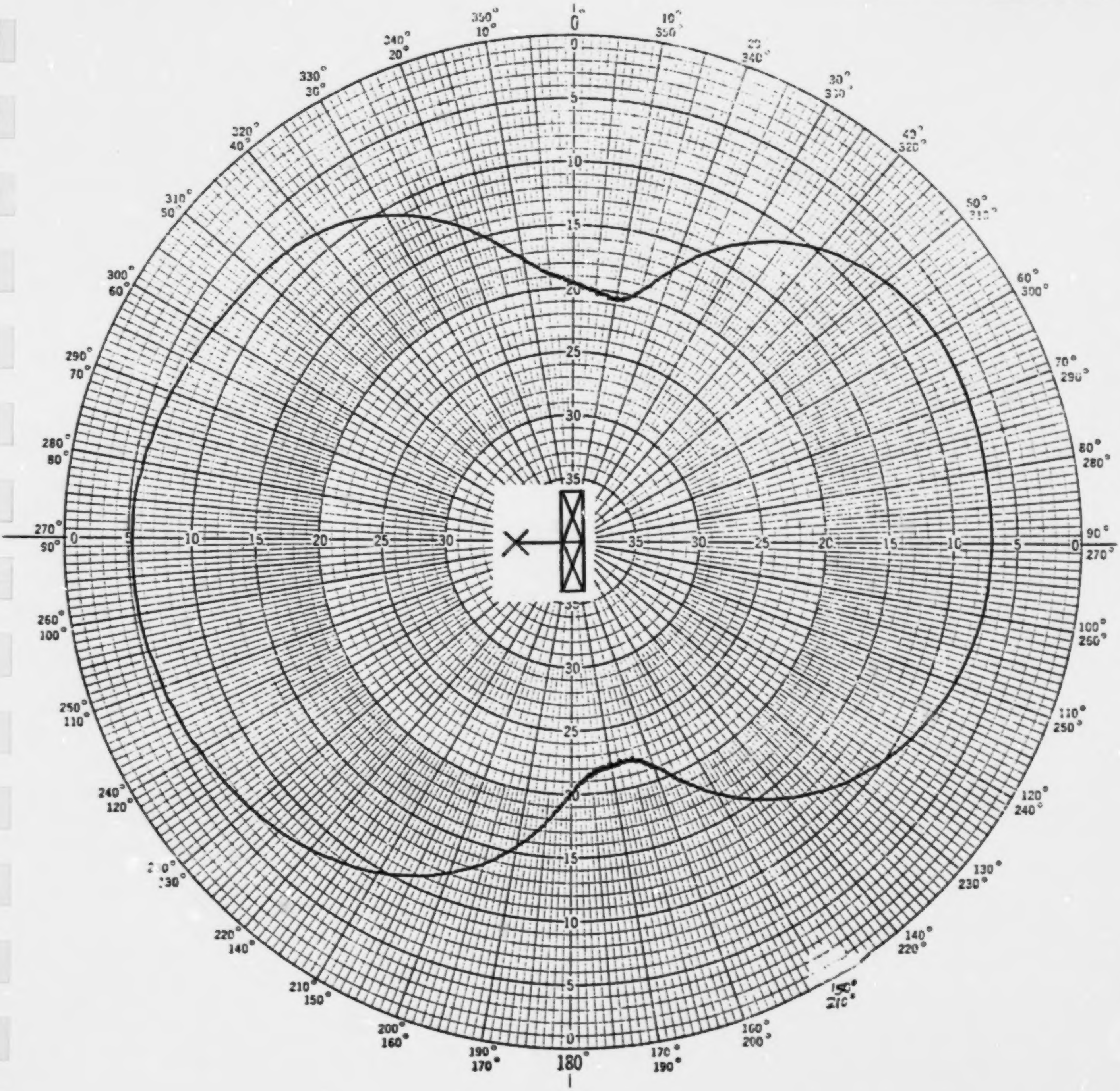
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: B

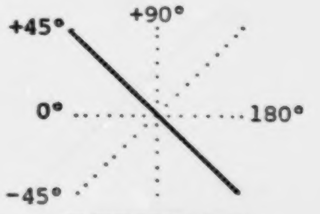
PATTERN NO.: BL6



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

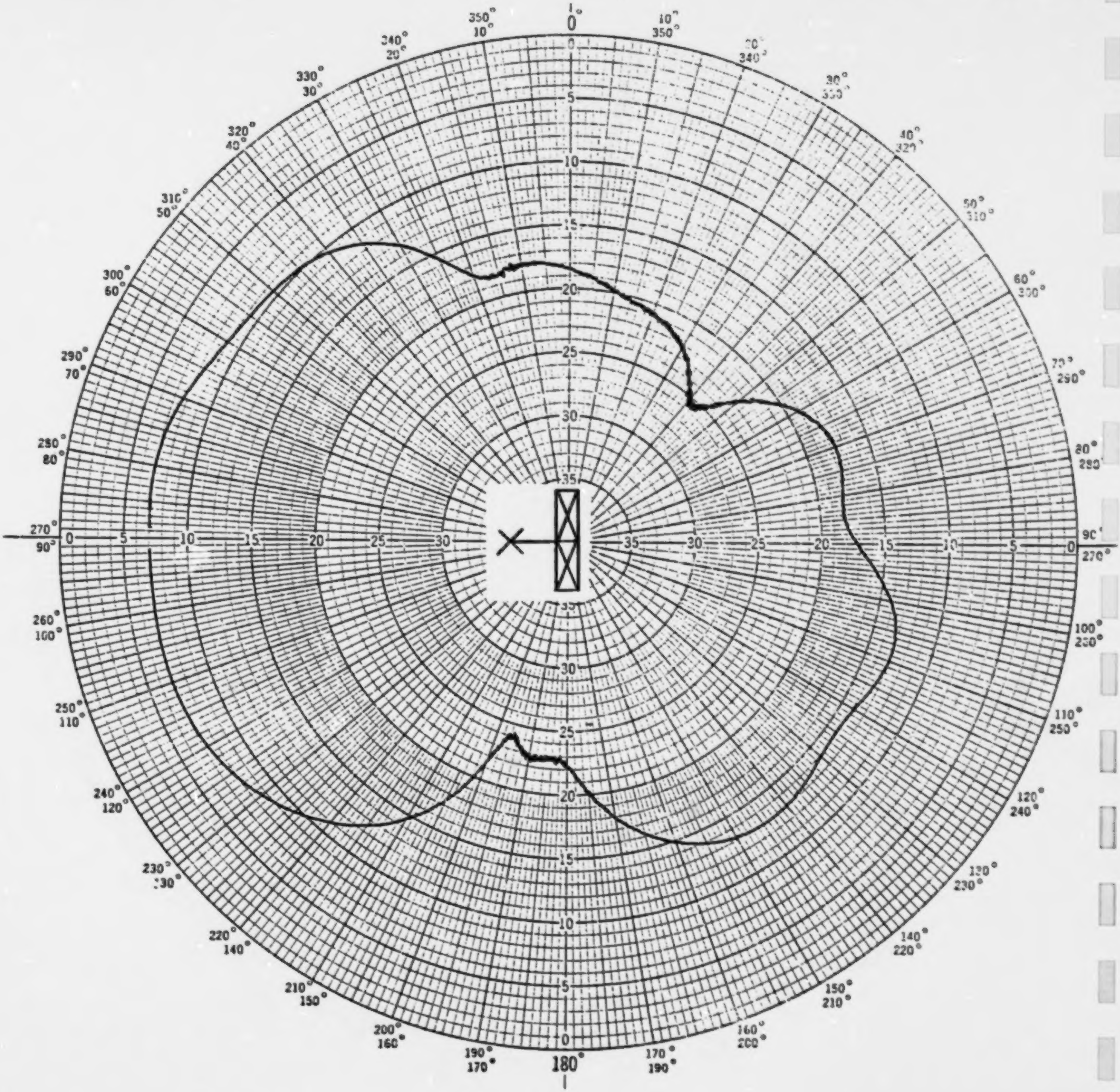
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: B

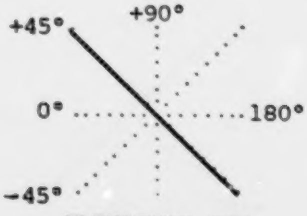
PATTERN NO.: BL7



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

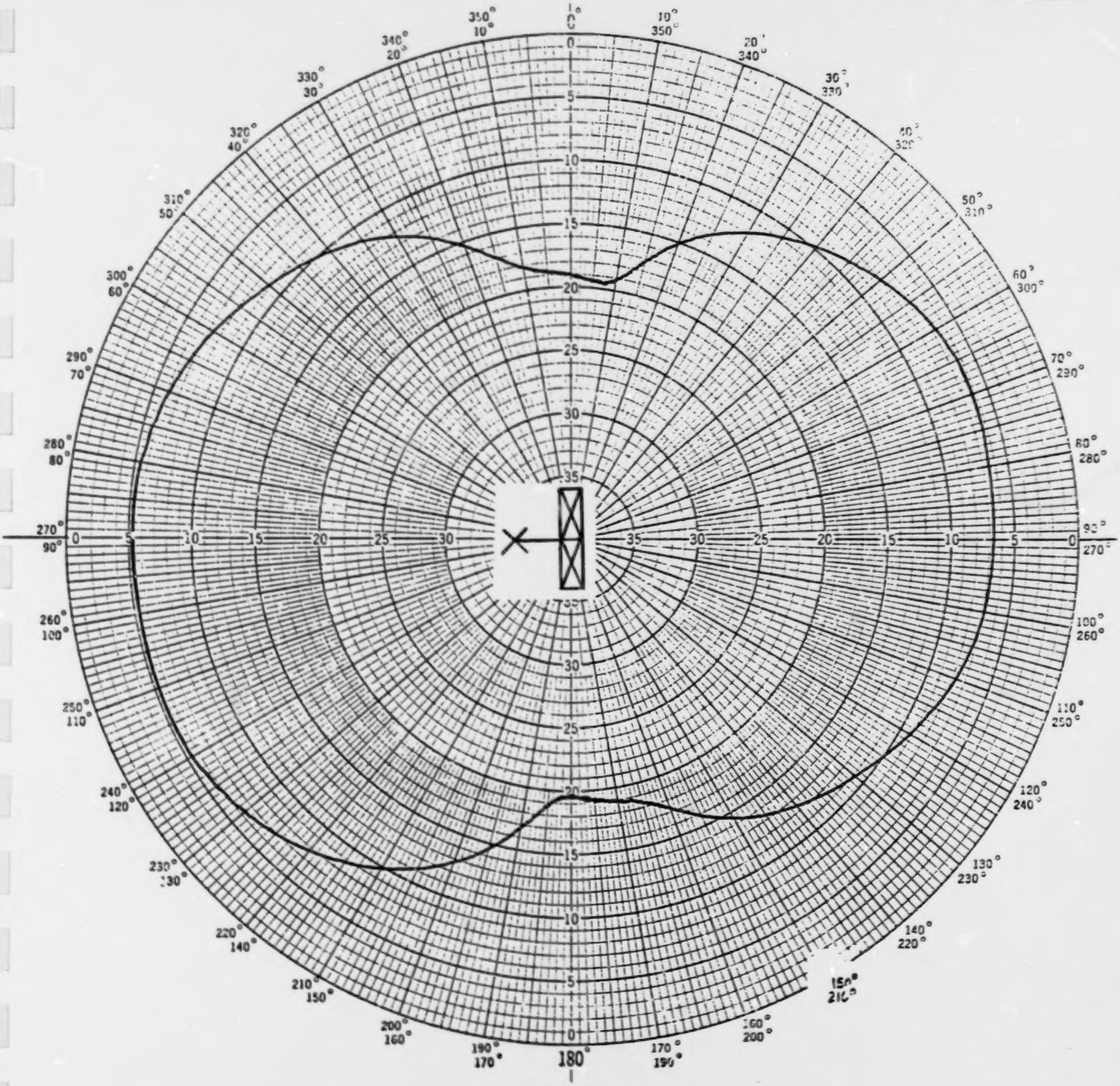
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: B

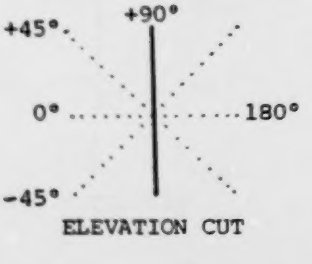
PATTERN NO.: BL8



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

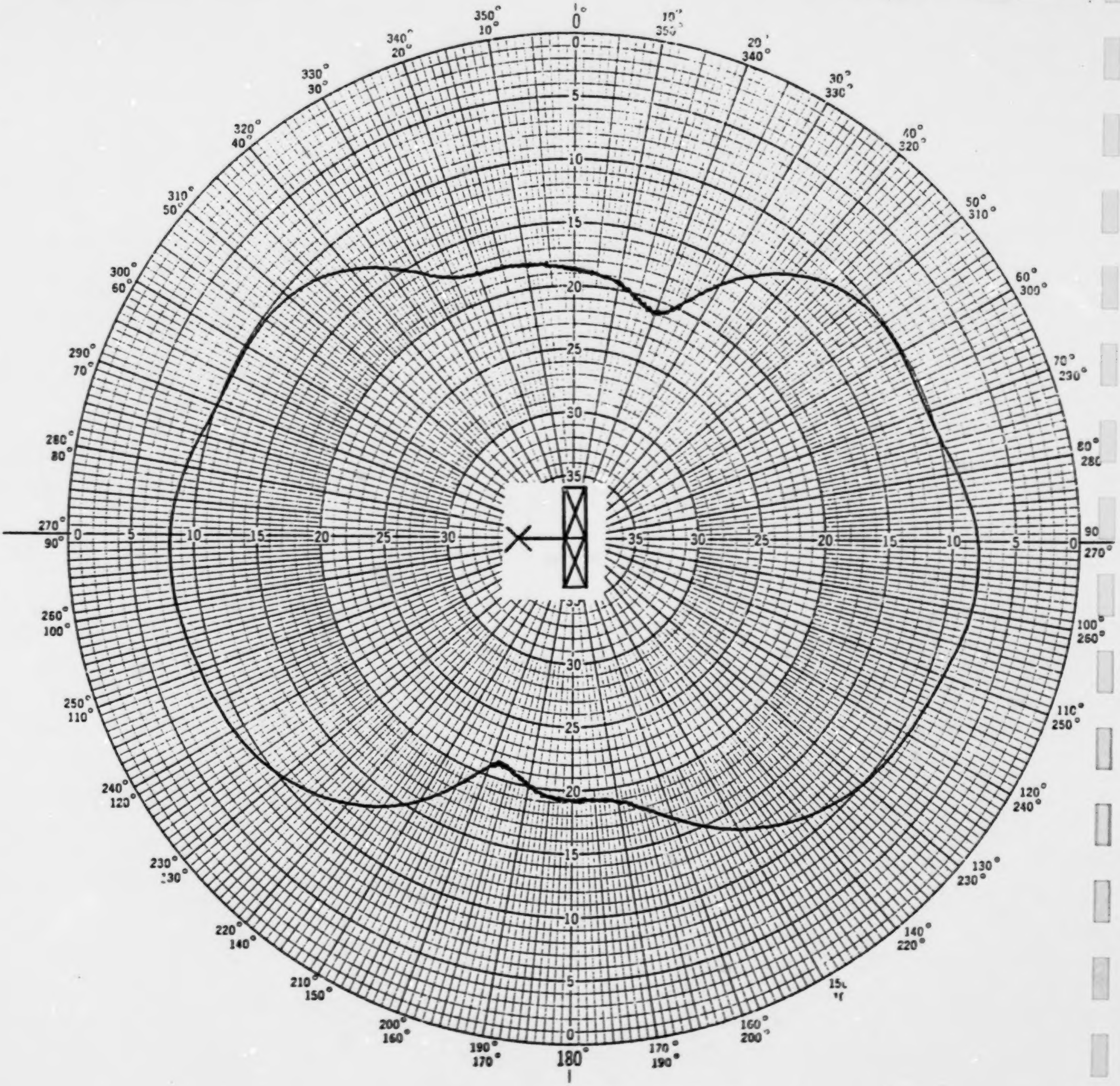
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: B

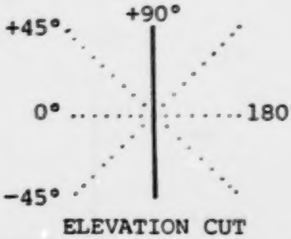
PATTERN NO.: BL9



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

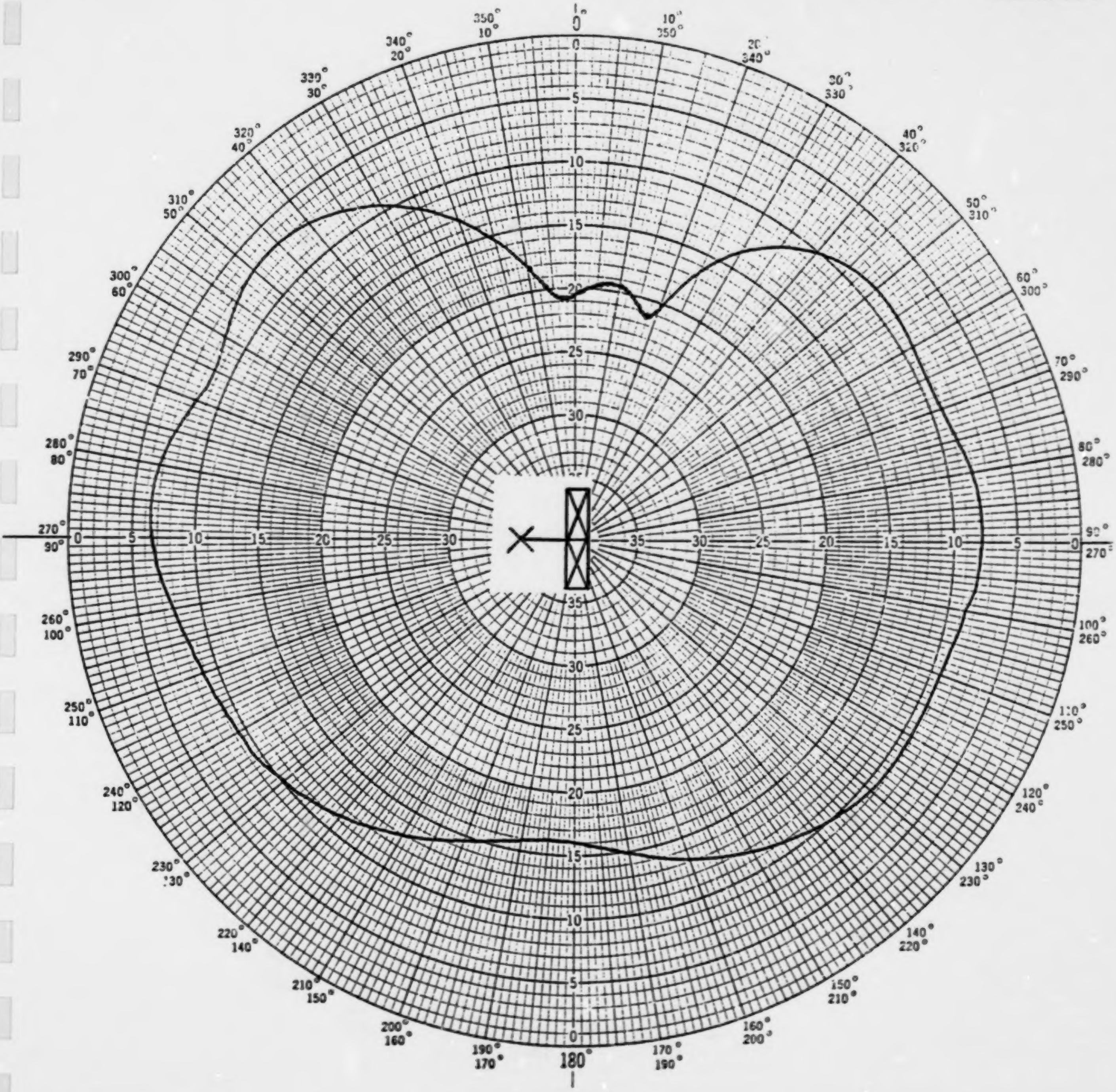
HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

RING RADIUS: 51"

Micro
Communications
Inc.

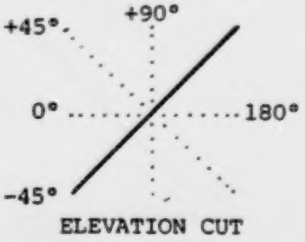
DATE: 8/5/81
MODEL: B
PATTERN NO.: BL10



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

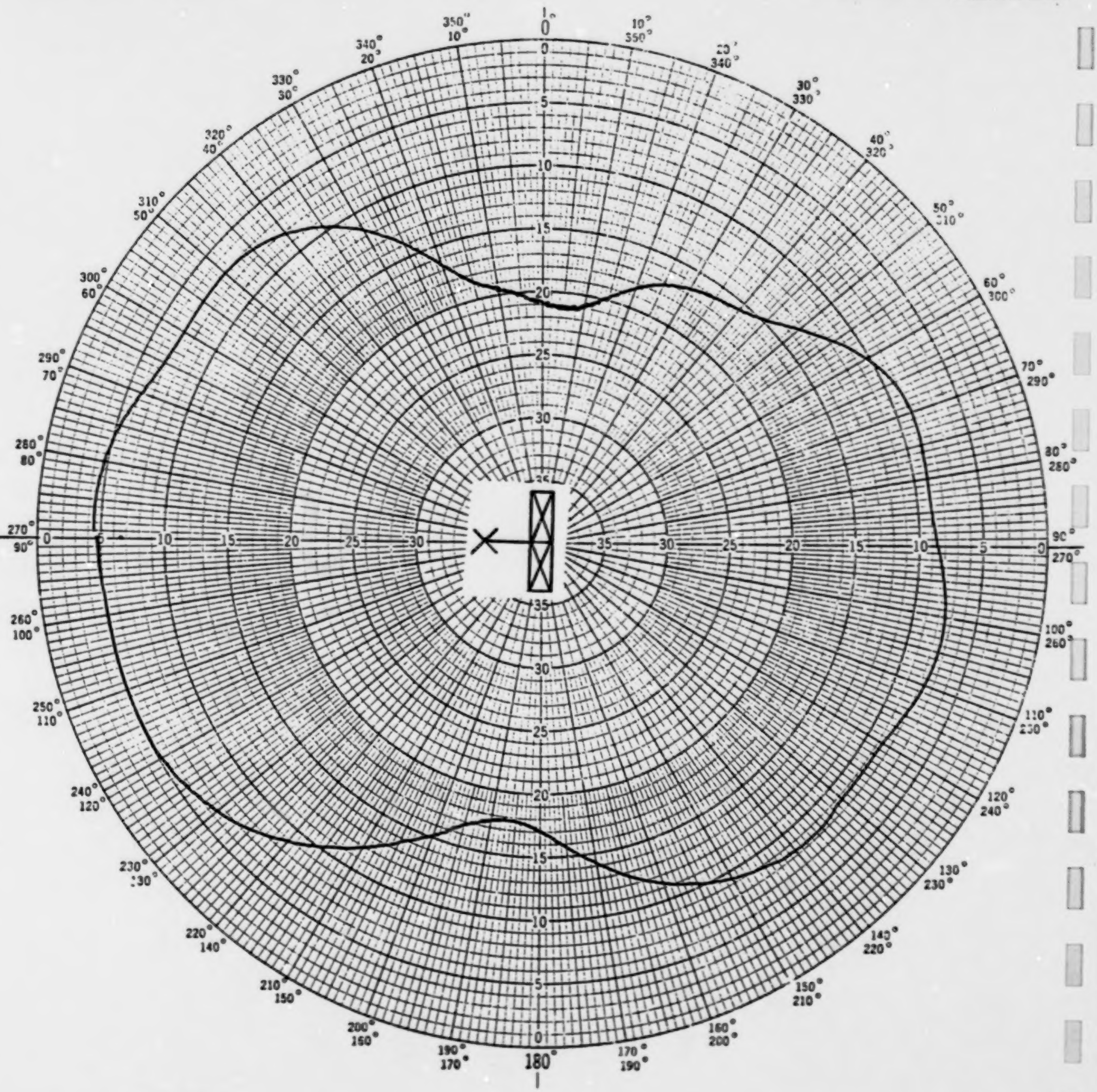
HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 51"

Micro
Communications
Inc.

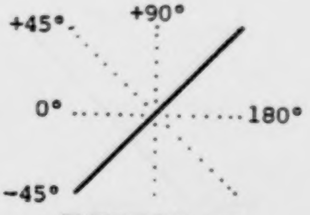
DATE: 8/5/81
MODEL: B
PATTERN NO.: BL11



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

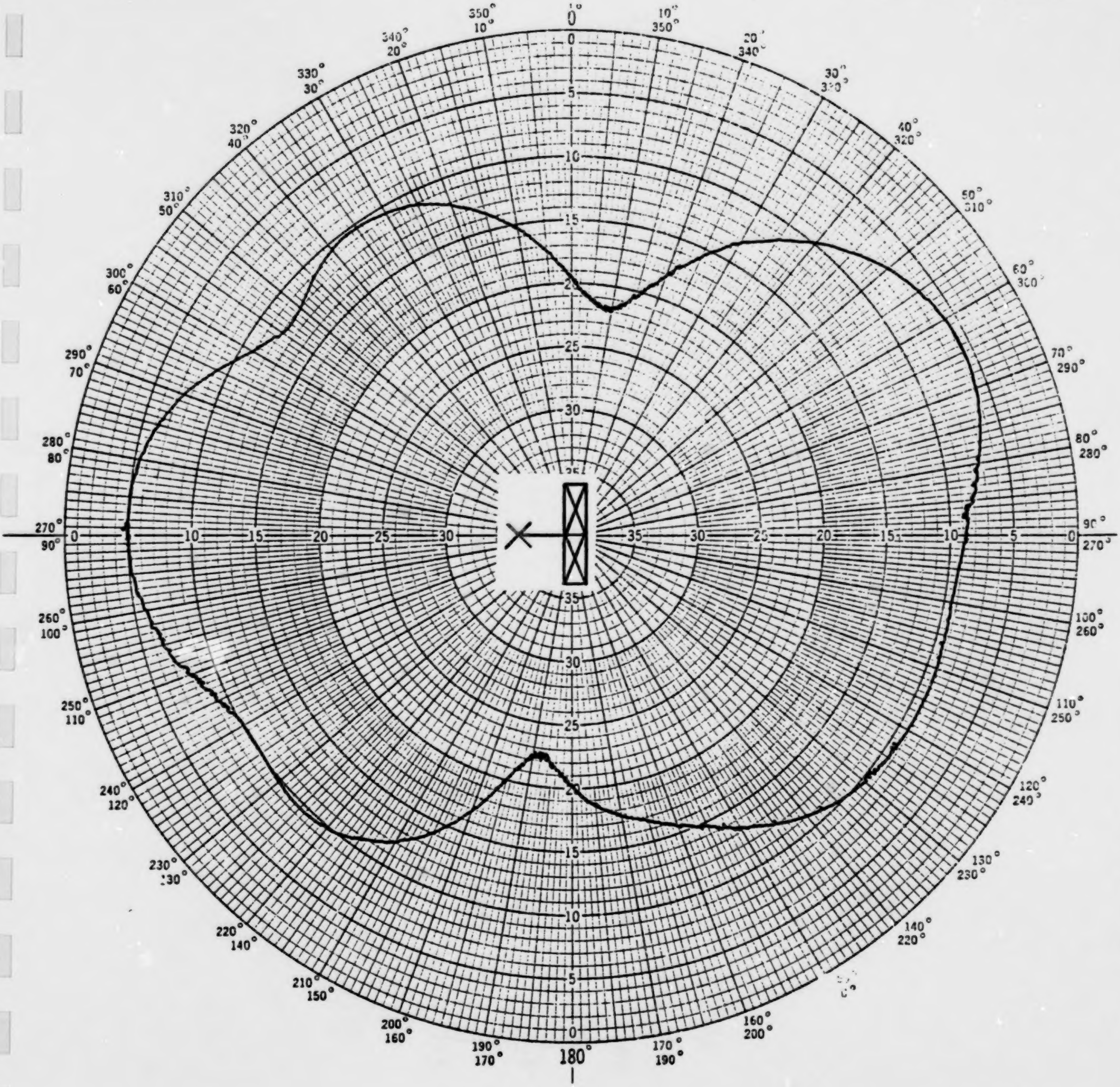
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: B

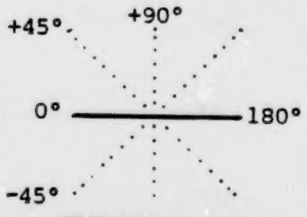
PATTERN NO.: BL12



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 18.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

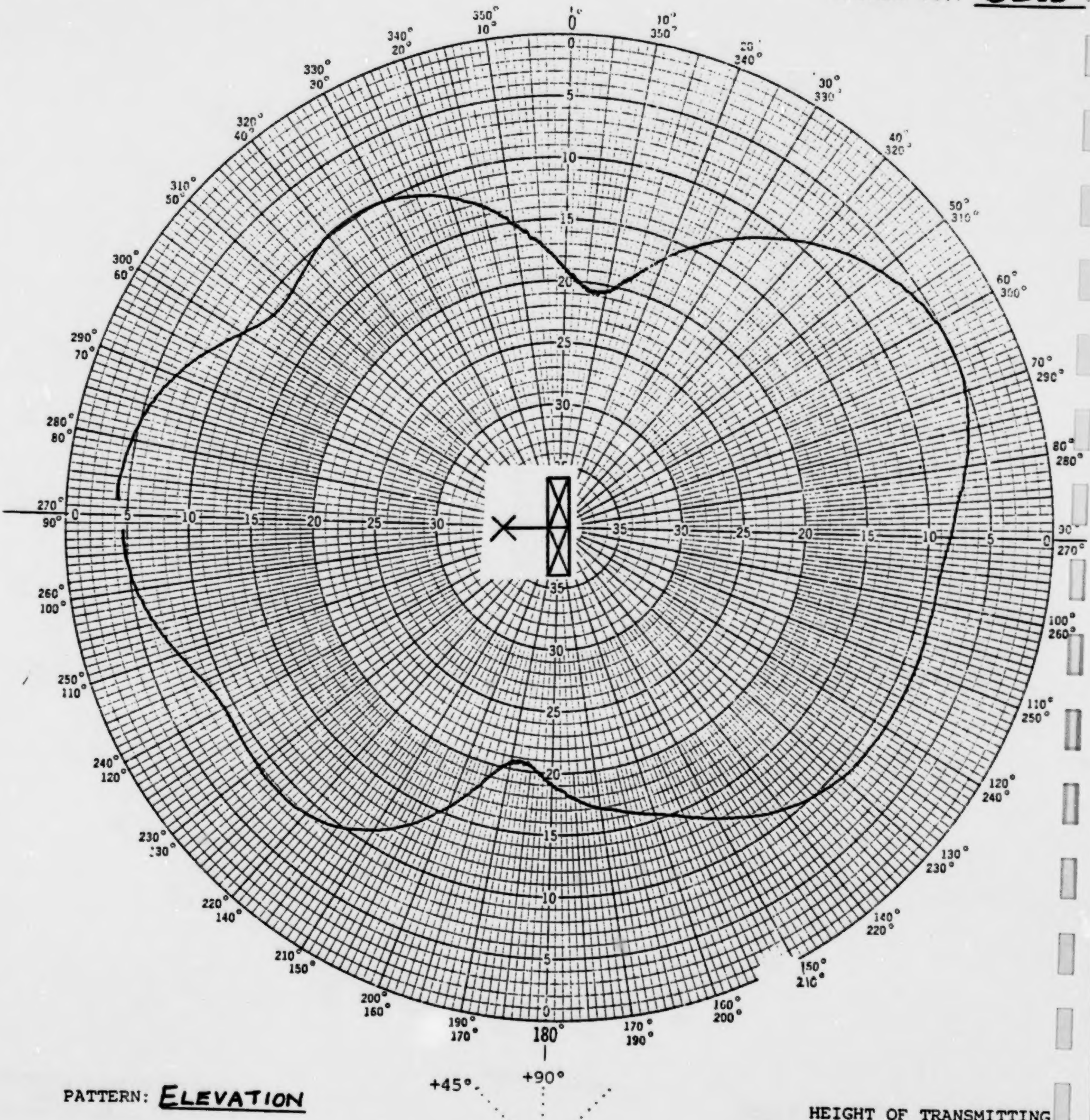
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: B

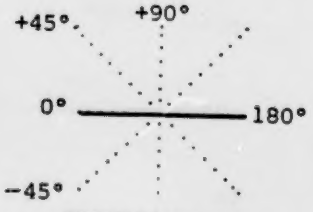
PATTERN NO.: BL13



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

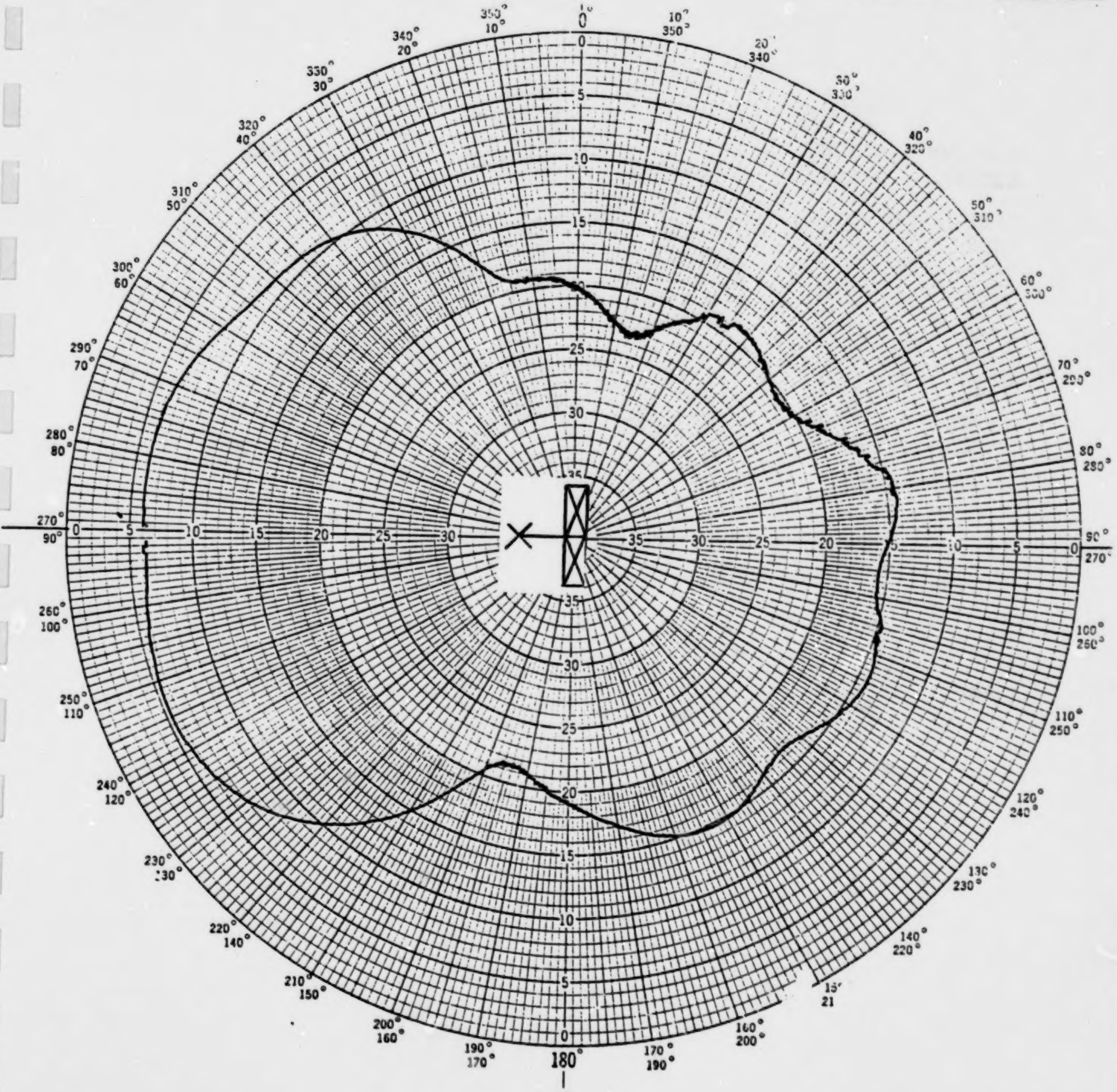
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: B

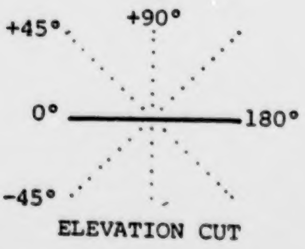
PATTERN NO.: BL14



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

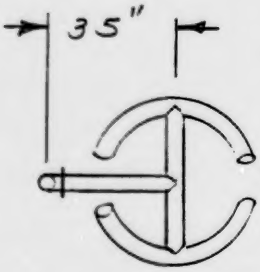
DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

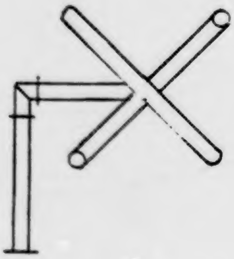
RING RADIUS: 51"

## MODEL "C"
## FREE SPACE MEASUREMENTS
July 31, 1981

| PATTERN NUMBER | * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLAR-IZATION | REMARKS |
|---|---|---|---|---|---|
| CFS1 | (113) | 19.5 | Axial Ratio | | |
| CFS2 | (114) | 19.5 | Azimuth | Hoz. | |
| CFS3 | (115) | 19.5 | Azimuth | Vert. | |
| CFS4 | (116) | 19.5 | Elevation | Hoz. | 0-180 cut |
| CFS5 | (117) | 19.5 | Elevation | Vert. | 0-180 cut |
| CFS6 | (118) | 19.5 | Elevation | Hoz. | +45 cut |
| CFS7 | (119) | 19.5 | Elevation | Vert. | +45 cut |
| CFS8 | (120) | 19.5 | Elevation | Hoz. | +90 cut |
| CFS9 | (121) | 19.5 | Elevation | Vert. | +90 cut |
| CFS10 | (122) | 19.5 | Elevation | Hoz. | -45 cut |
| CFS11 | (123) | 19.5 | Elevation | Vert. | -45 cut |

*Page Numbers



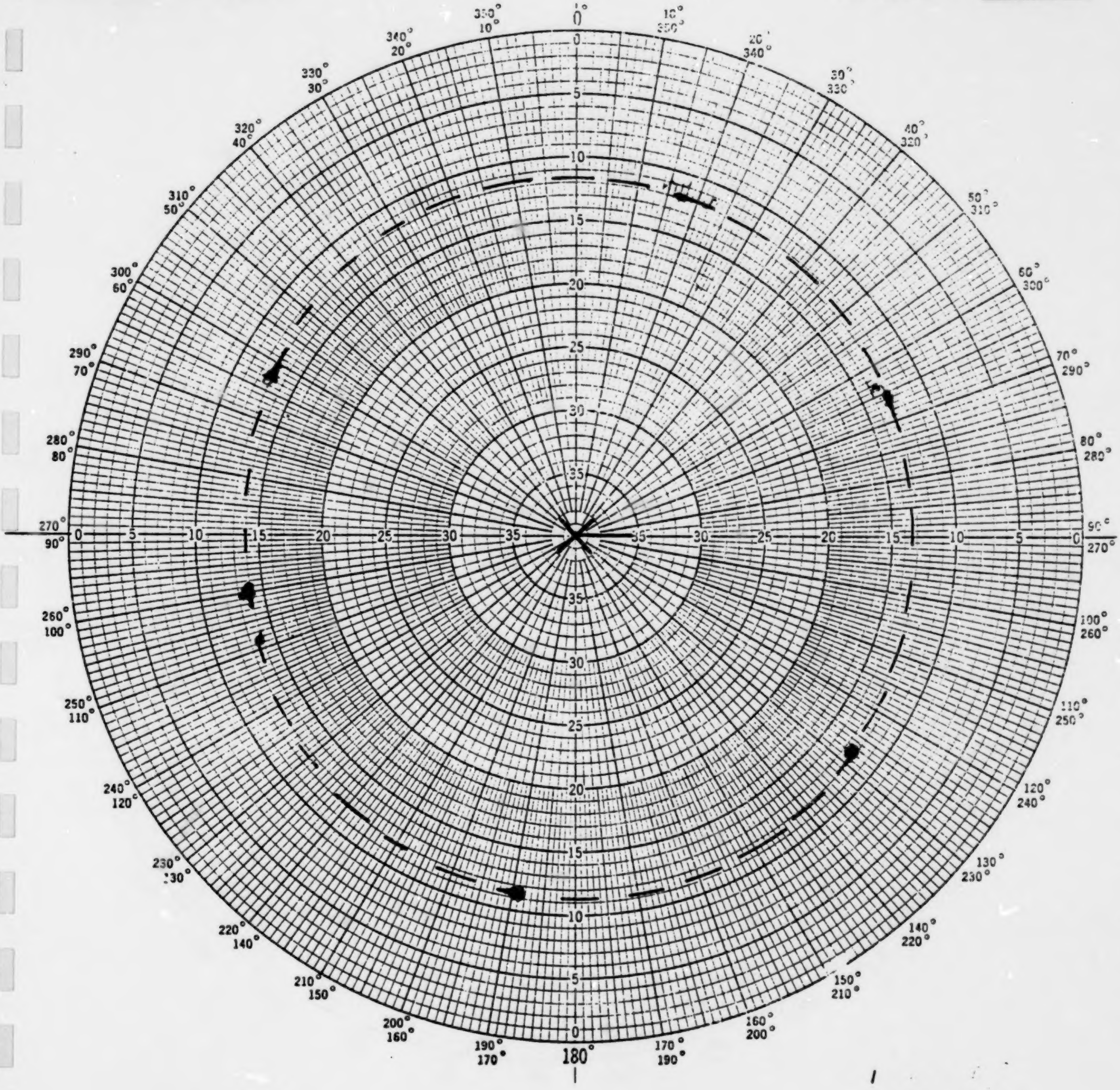


**Micro Communications Inc.**

DATE: 7/31/81

MODEL: C

PATTERN NO.: CFS1



PATTERN: AXIAL RATIO

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: ________

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

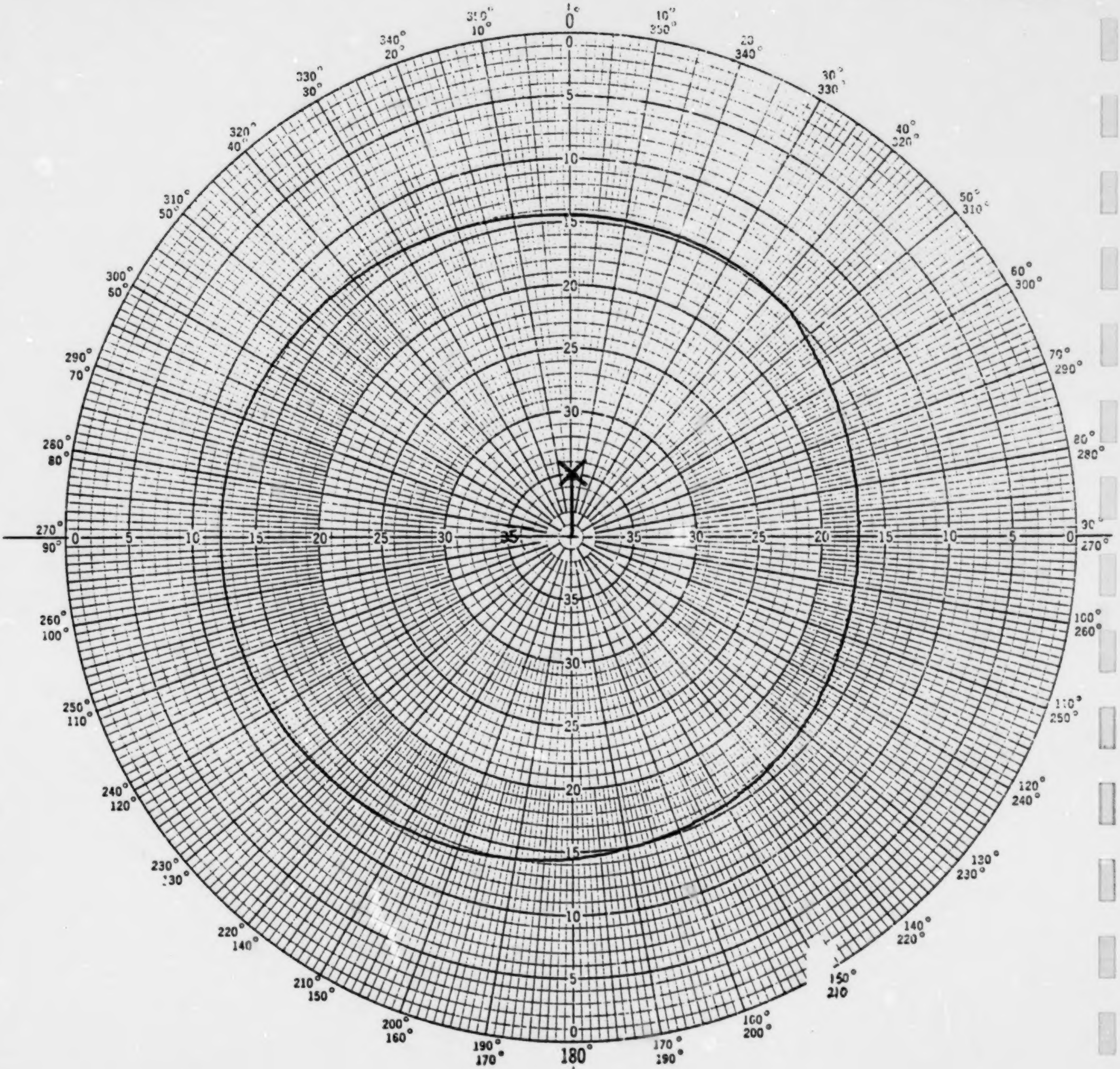
RING RADIUS: 35"

Micro Communications Inc.

DATE: 7/31/81

MODEL: C

PATTERN NO.: CFS2



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

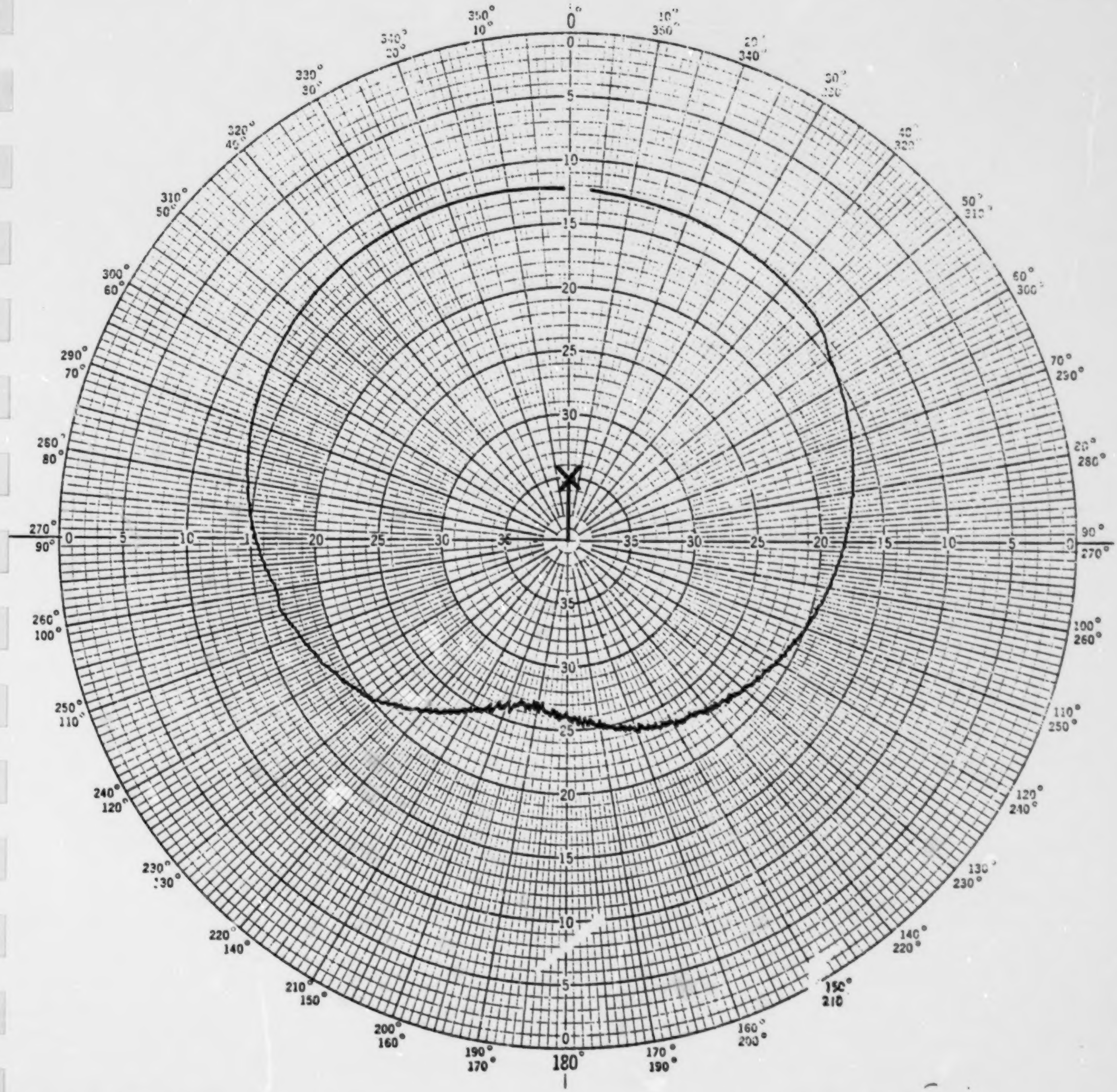
HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 35"

MCi Micro Communications Inc.

DATE: 7/31/81
MODEL: C
PATTERN NO.: CFS3



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

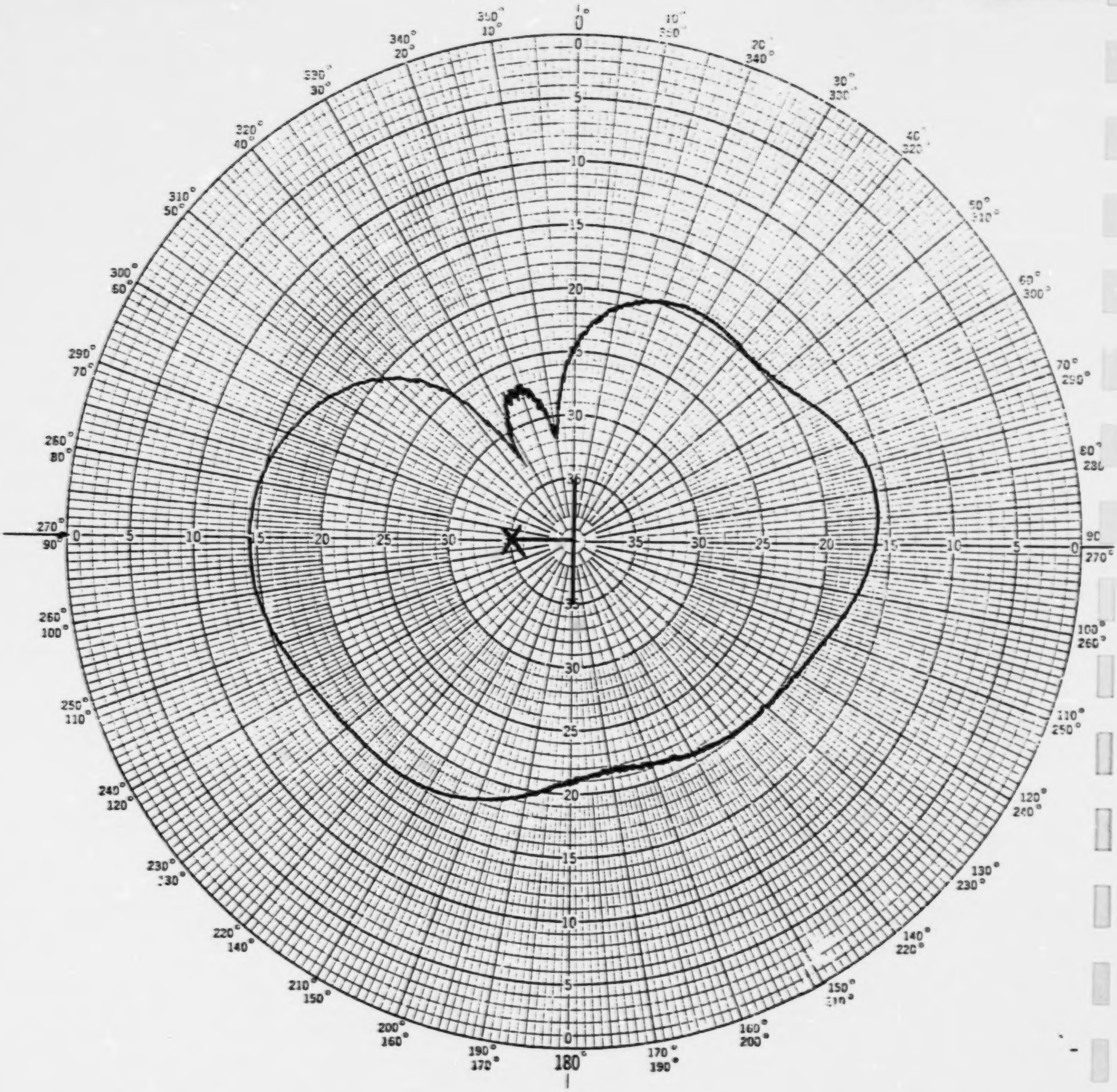
RING RADIUS: 35 FT.

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: C

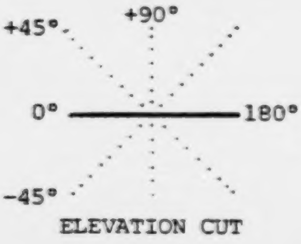
PATTERN NO.: CFS4



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

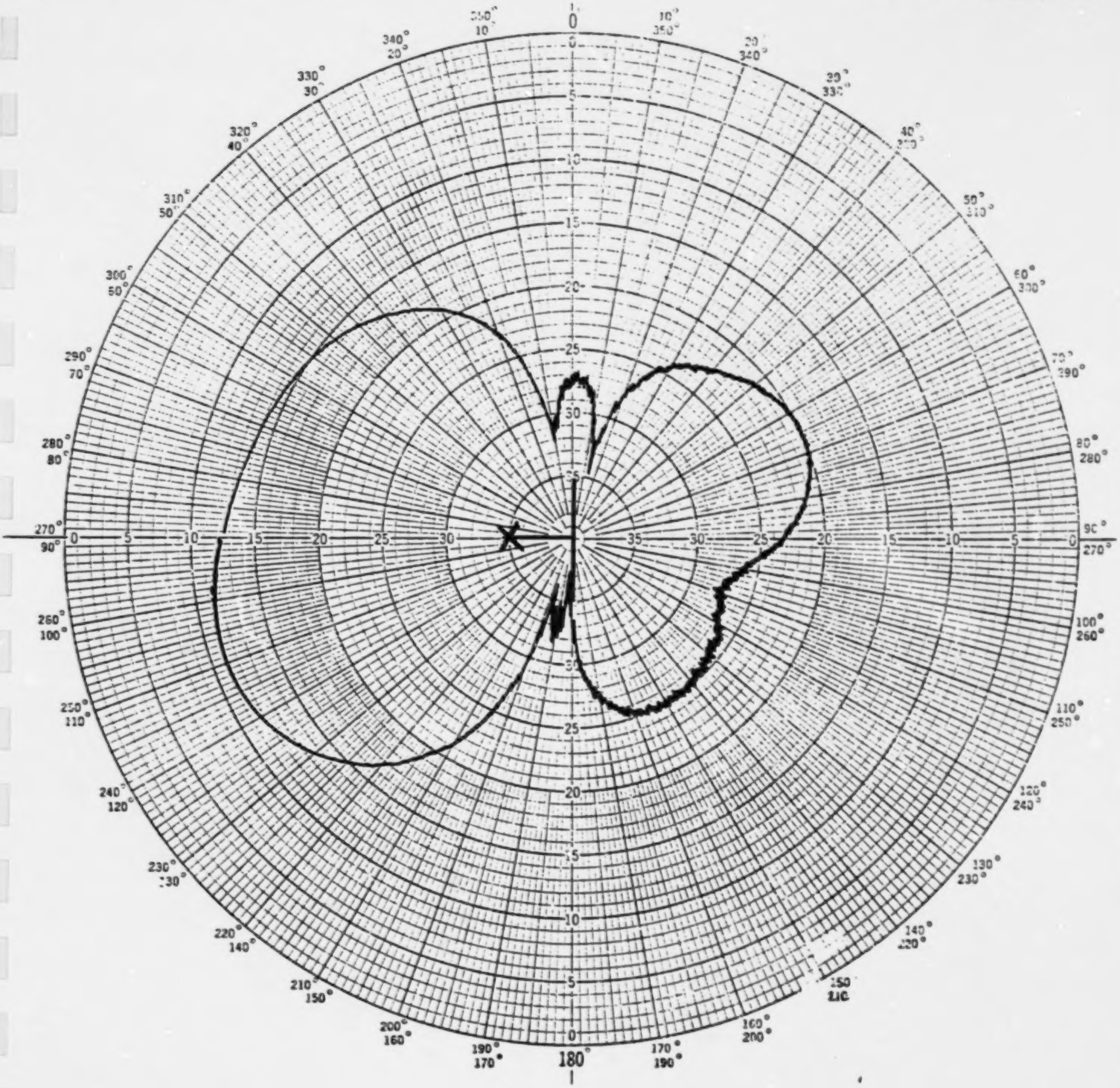
RING RADIUS: 35"

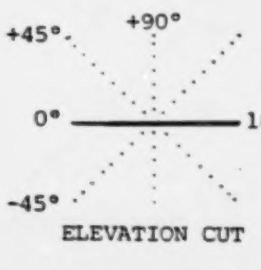
**Micro Communications Inc.**

DATE: 7/31/81

MODEL: C

PATTERN NO.: CFS5





PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

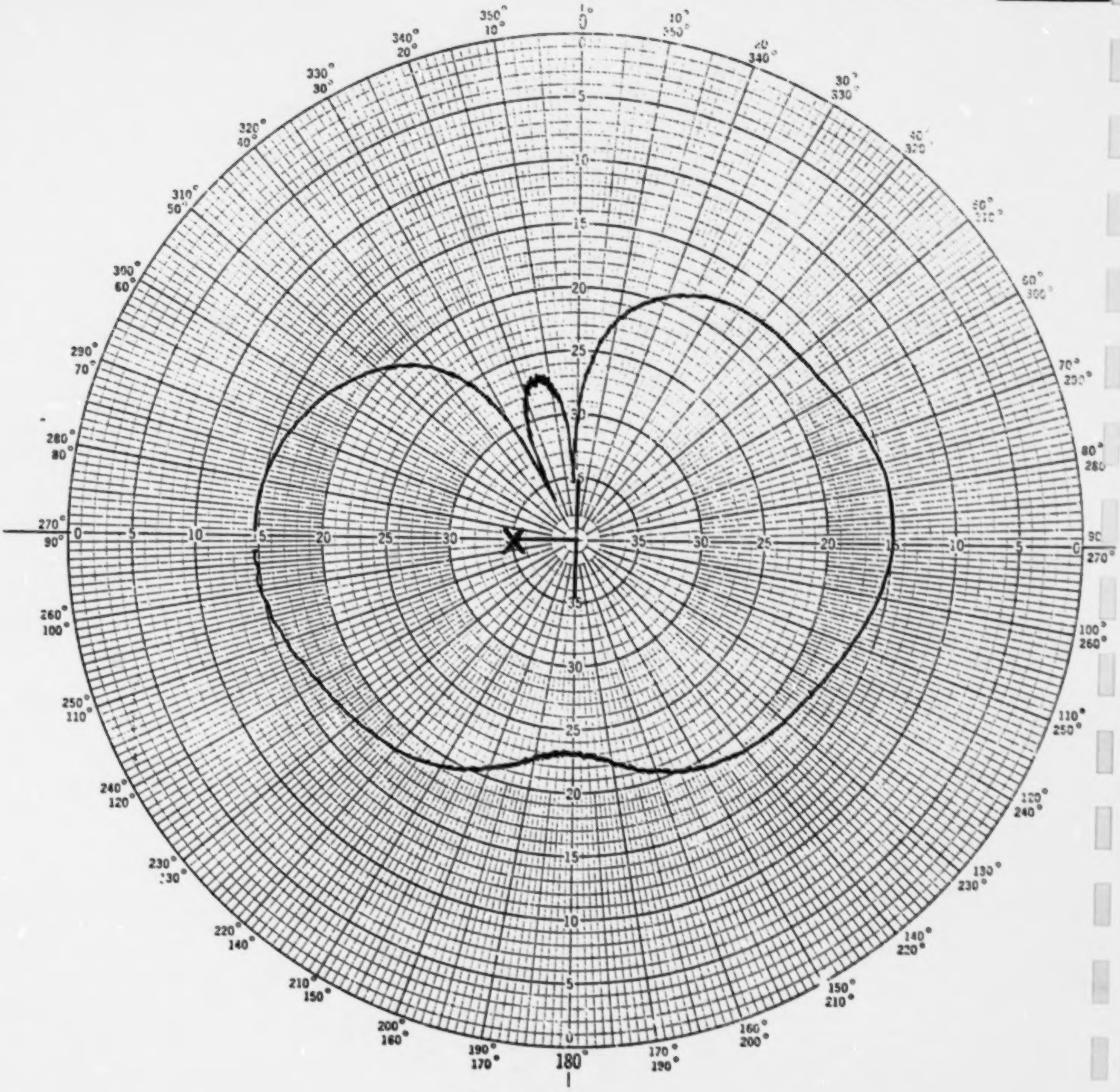
RING RADIUS: 35"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: C

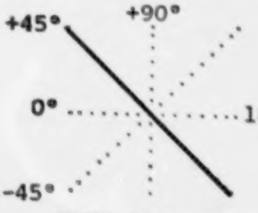
PATTERN NO.: CFS6



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FREE SPACE

TRANSMITTING ANTENNA POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

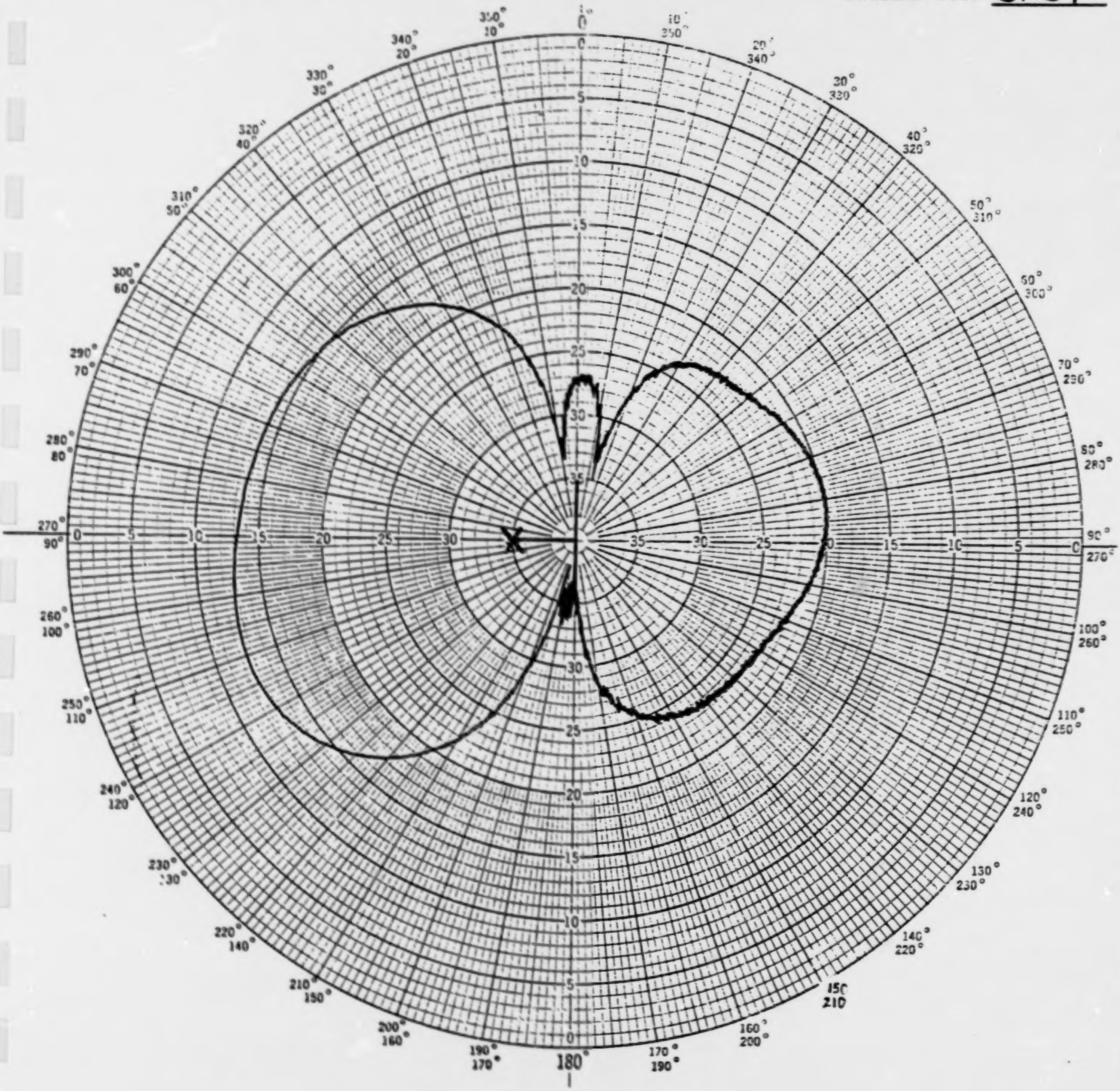
RING RADIUS: 35"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: C

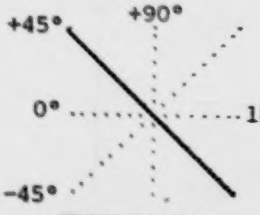
PATTERN NO.: CFS7



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

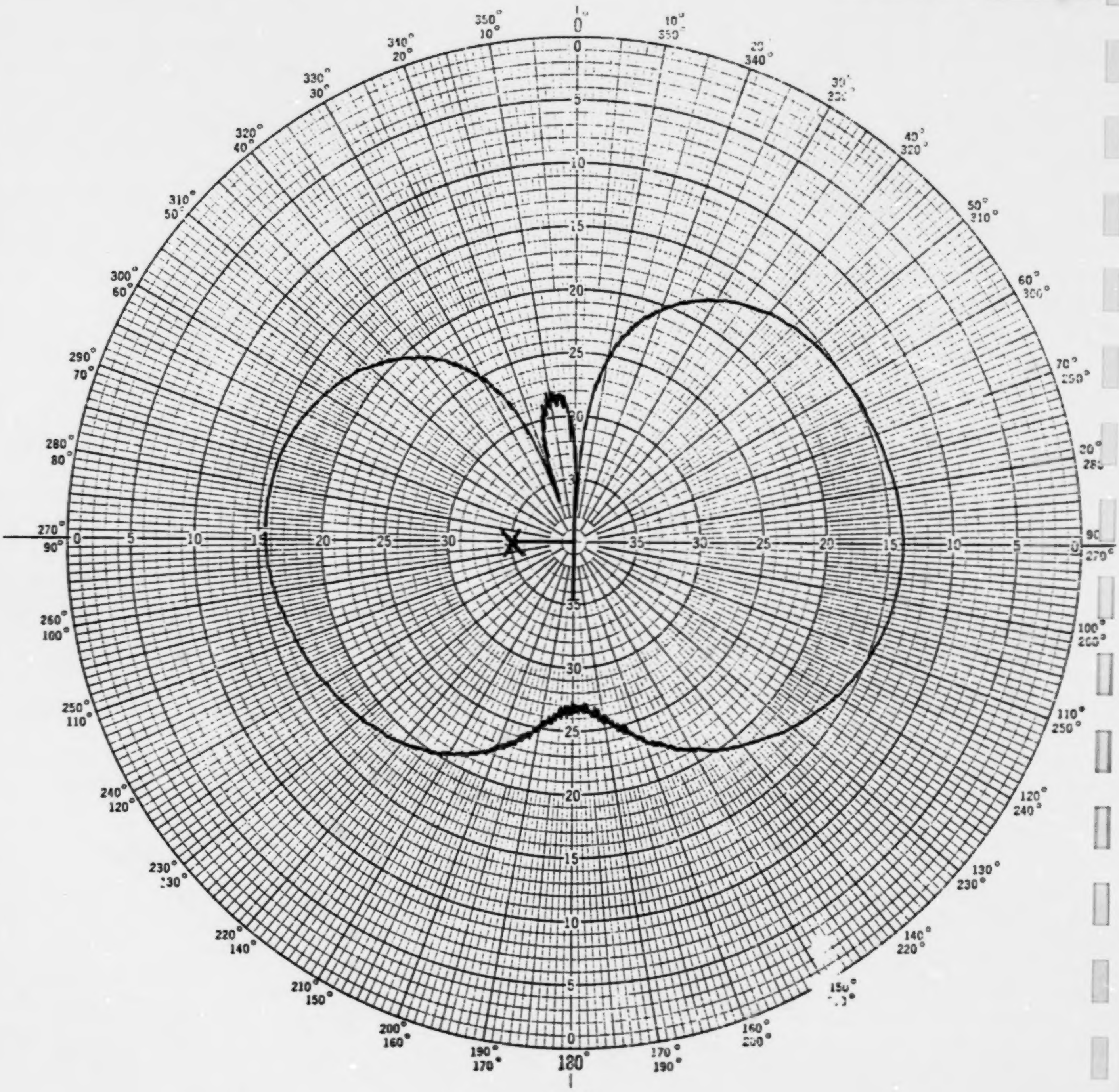
HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

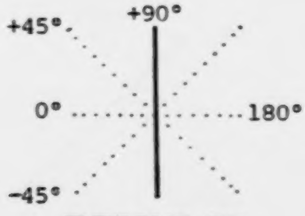
DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 35"

**Micro Communications Inc.**

DATE: 7/31/81
MODEL: C
PATTERN NO.: CFS8





ELEVATION CUT

PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

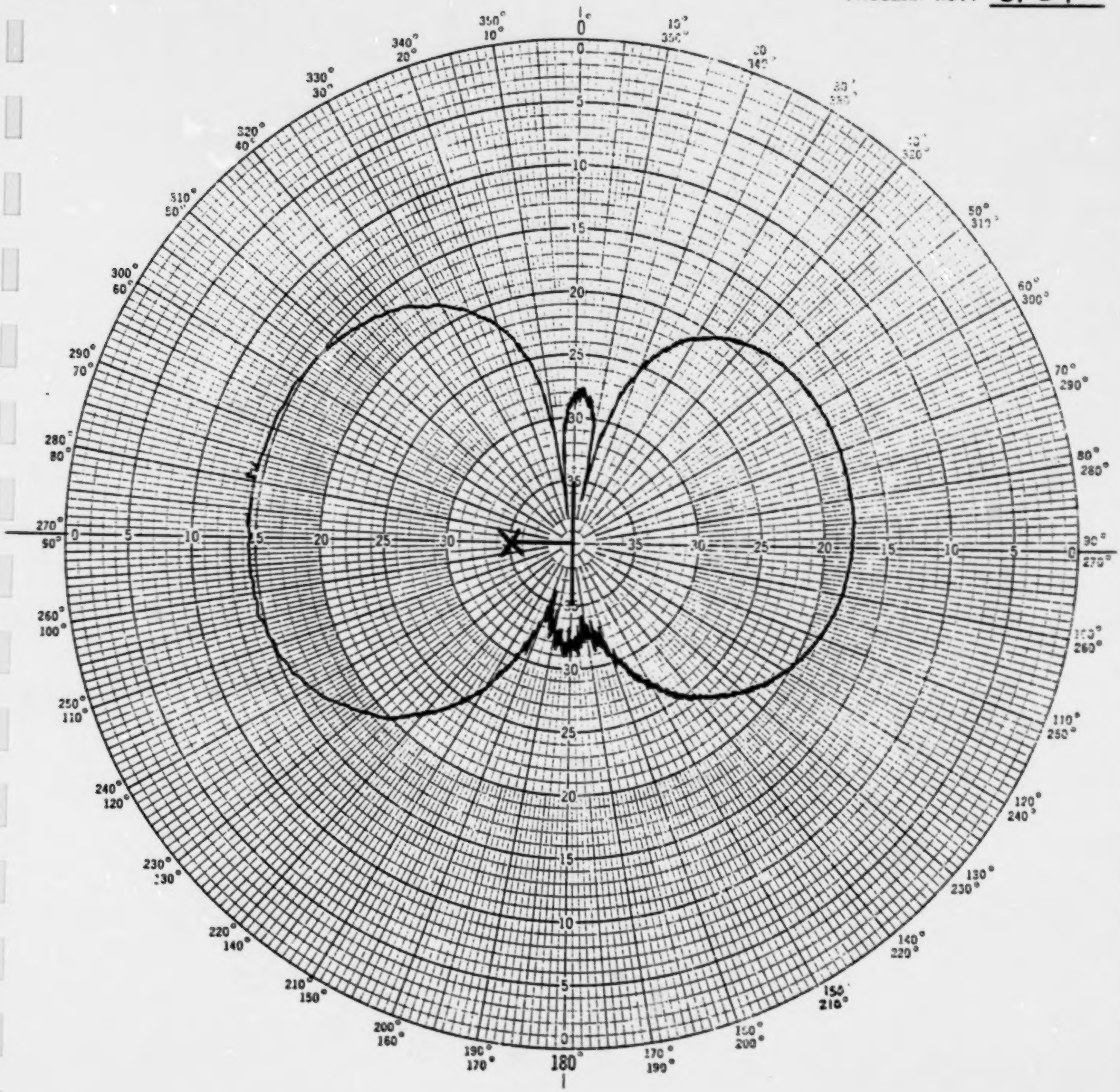
RING RADIUS: 35"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: C

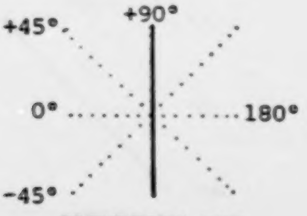
PATTERN NO.: CFS9



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

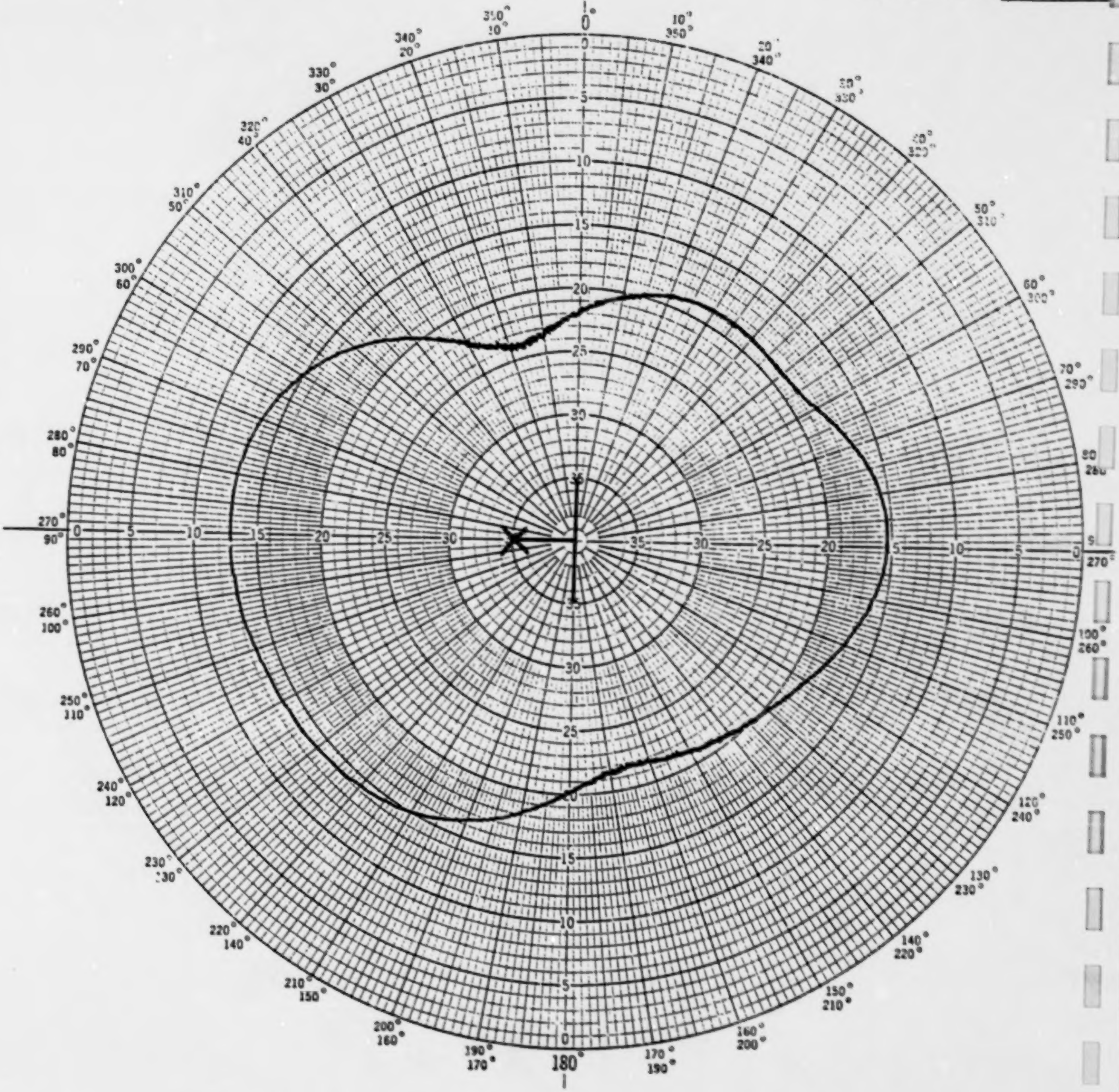
RING RADIUS: 35"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: C

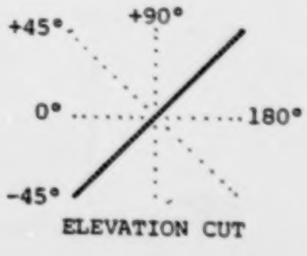
PATTERN NO.: CFS10



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

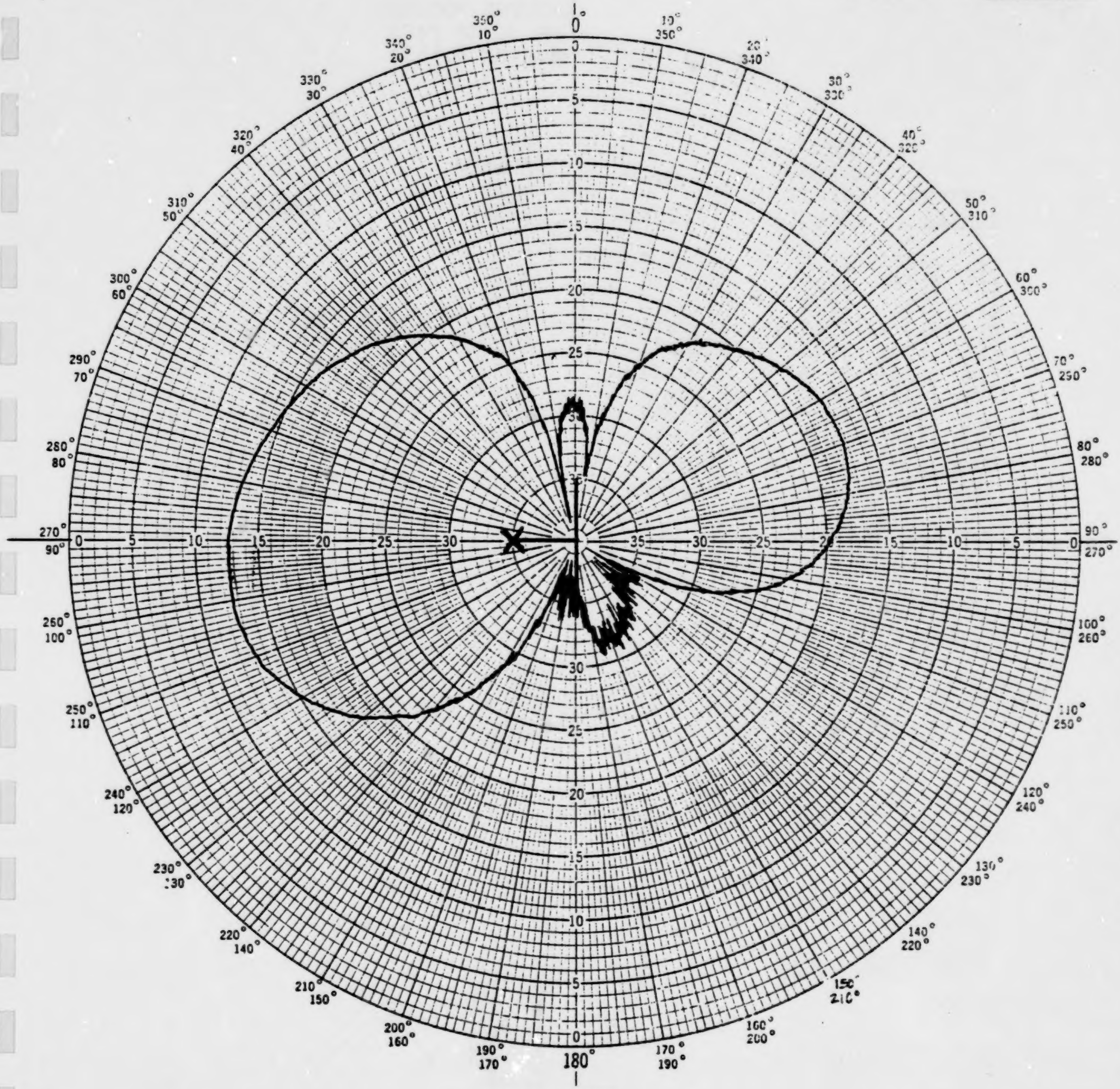
HEIGHT OF TRANSMITTING
ANTENNA: 19.5 Ft.

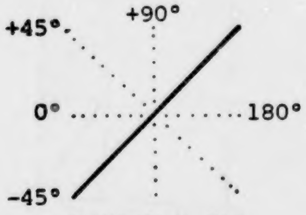
DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 Ft.

RING RADIUS: 35"

MCi Micro Communications Inc.

DATE: 7/31/81
MODEL: C
PATTERN NO.: CFS11





ELEVATION CUT

PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

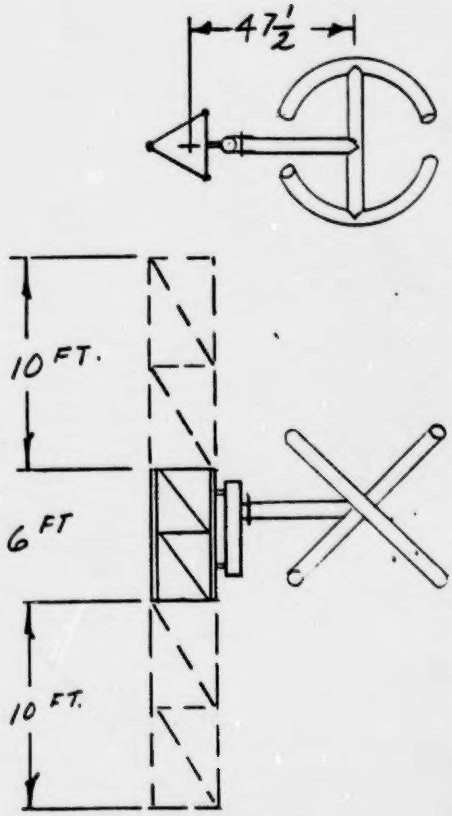
DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 35"

## MODEL "C"
## ANTENNA MOUNTED
## ON TOWER FACE
## August 5,1981

| PATTERN NUMBER * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLAR-IZATION | REMARKS |
|---|---|---|---|---|
| CF1 (125) | 19.5 | Axial Ratio | | |
| CF2 (126) | 19.5 | Azimuth | Hoz. | |
| CF3 (127) | 19.5 | Azimuth | Vert. | |
| CF4 (128) | 19.5 | Elevation | Hoz. | 0-180 cut |
| CF5 (129) | 19.5 | Elevation | Vert. | 0-180 cut |
| CF6 (130) | 19.5 | Elevation | Hoz. | +45 cut |
| CF7 (131) | 19.5 | Elevation | Vert. | +45 cut |
| CF8 (132) | 19.5 | Elevation | Hoz. | +90 cut |
| CF9 (133) | 19.5 | Elevation | Vert. | +90 cut |
| CF10 (134) | 19.5 | Elevation | Hoz. | -45 cut |
| CF11 (135) | 19.5 | Elevation | Vert. | -45 cut |

*Page Numbers

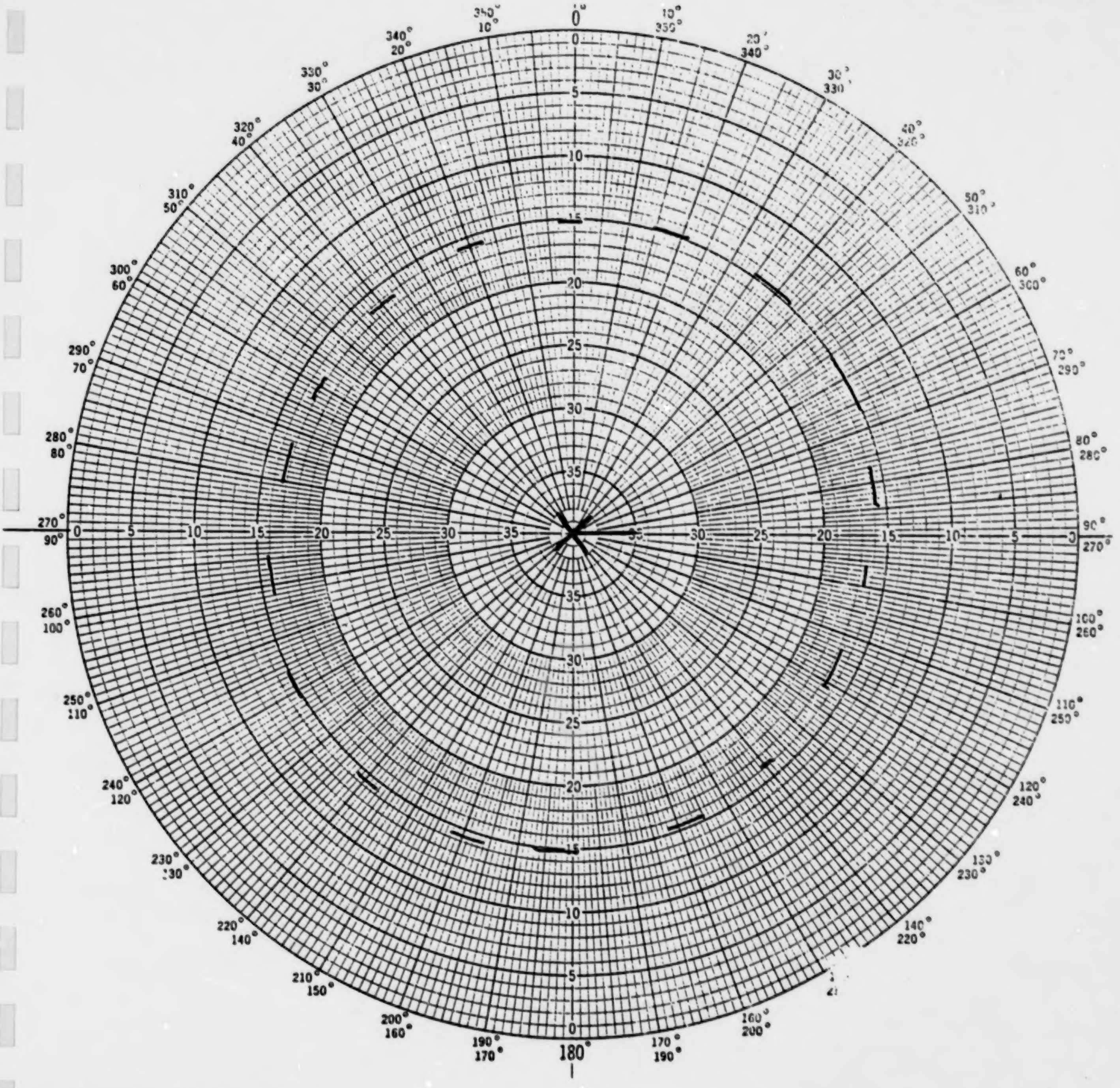


**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

PATTERN NO.: CF1



PATTERN: AXIAL RATIO

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION:

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

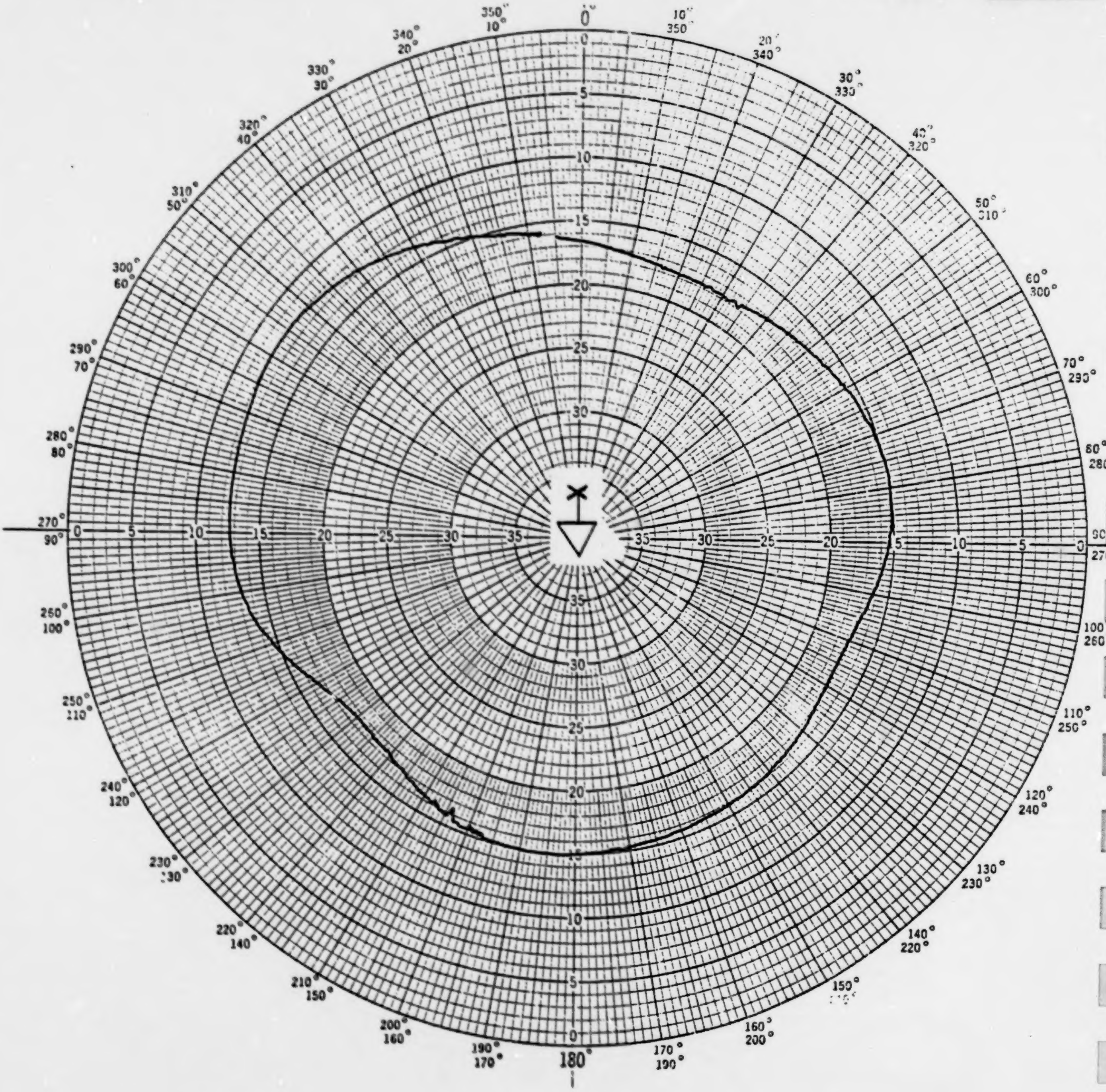
RING RADIUS: 47.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

PATTERN NO.: CF2



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

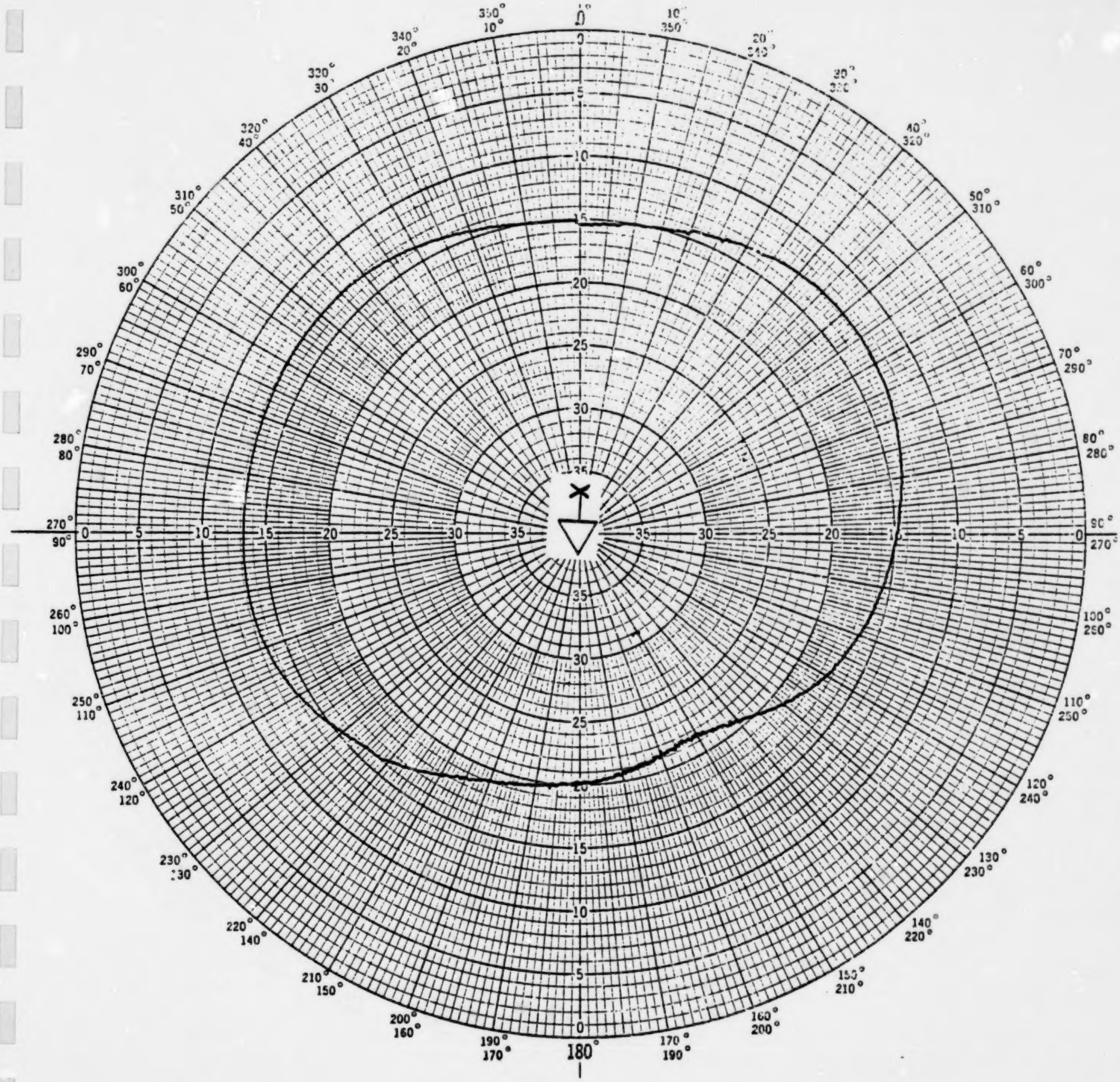
RING RADIUS: 47.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

PATTERN NO.: CF3



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

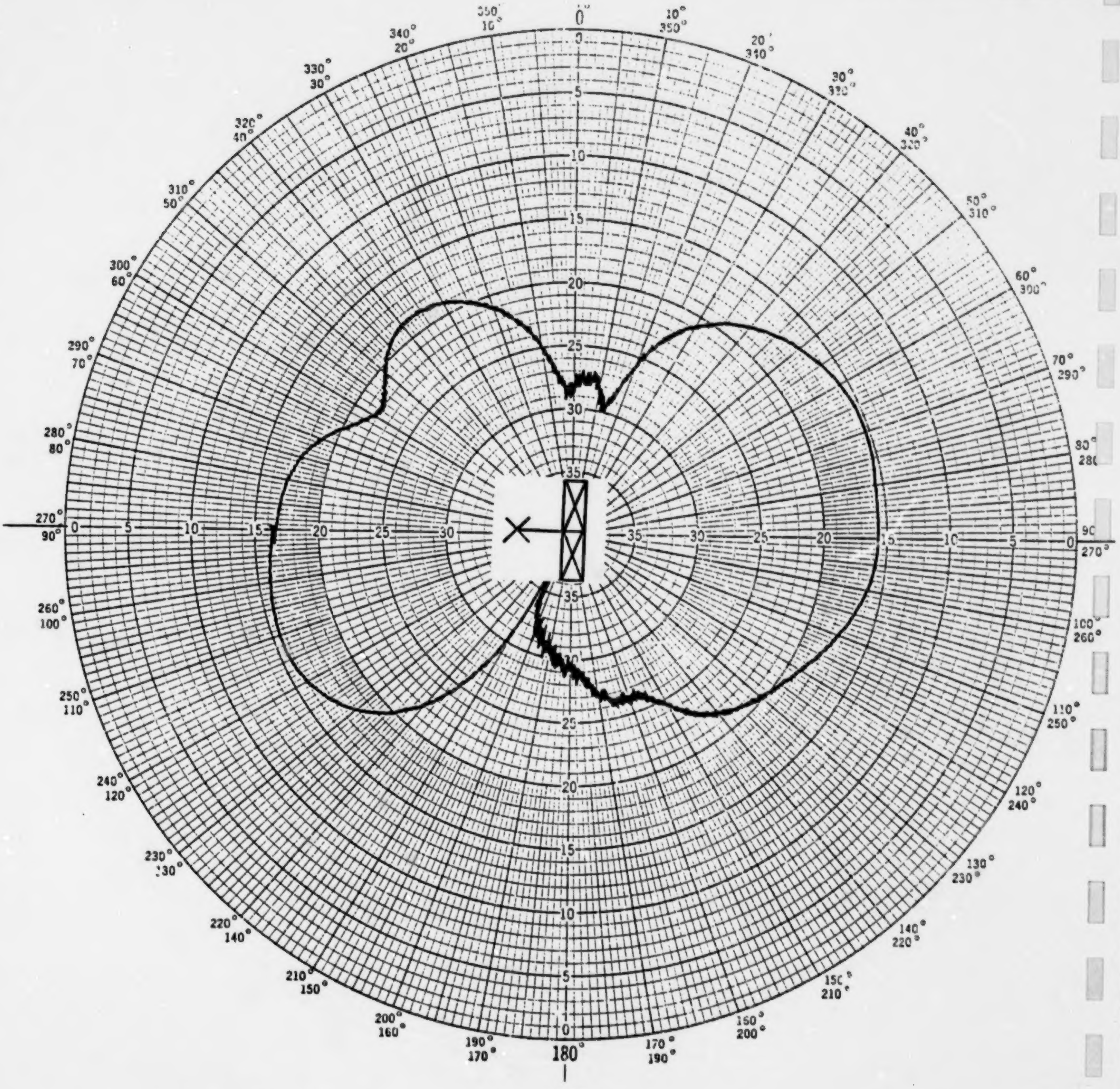
RING RADIUS: 47.5"

# Micro Communications Inc.

DATE: 8/5/81

MODEL: C

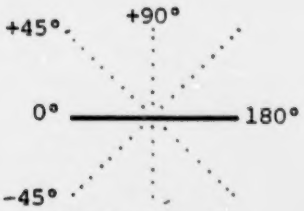
PATTERN NO.: CF4



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

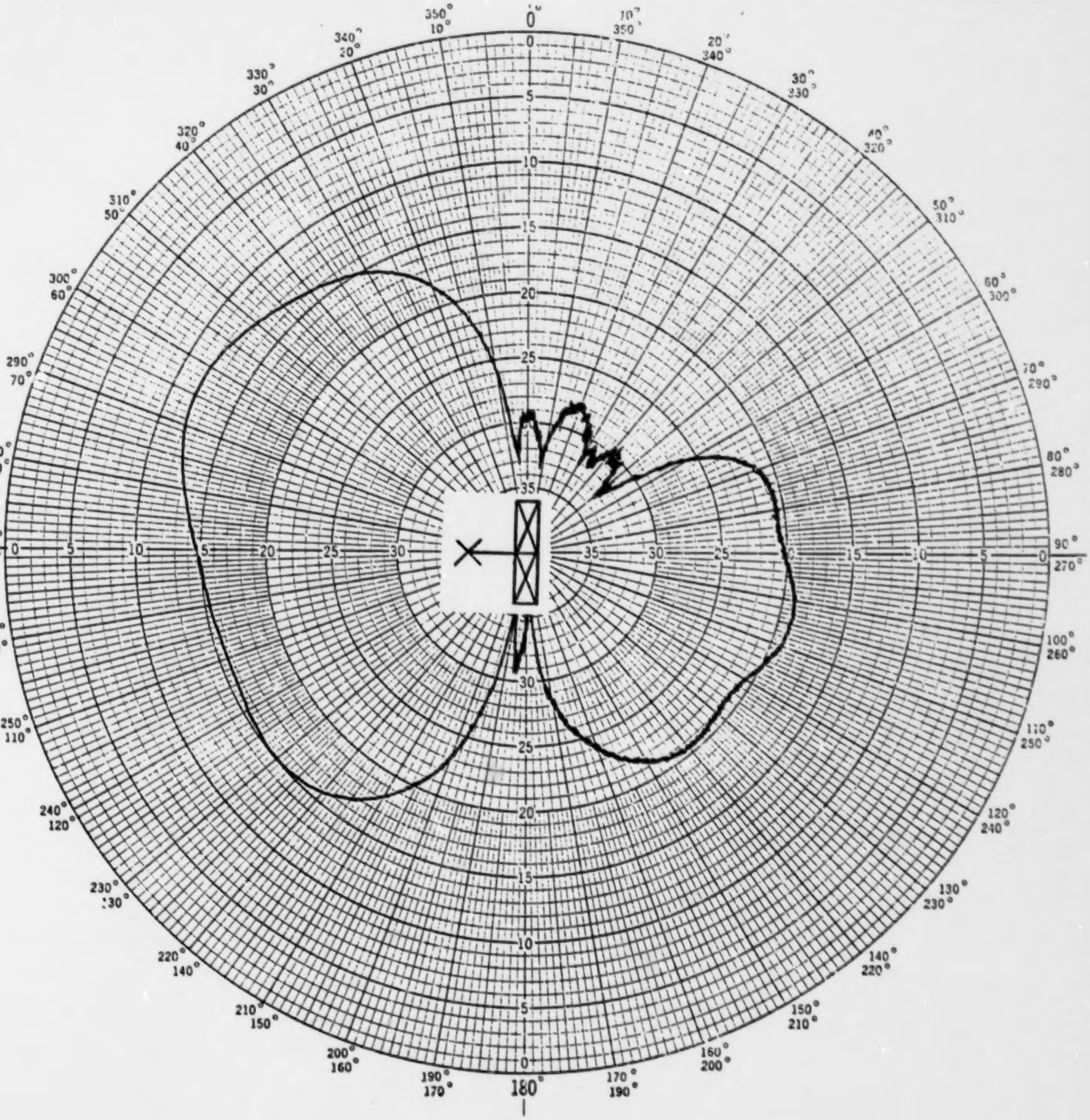
RING RADIUS: 47.5"

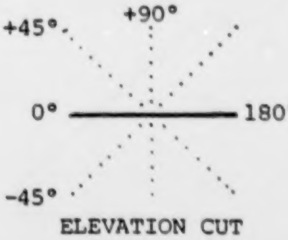
**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

PATTERN NO.: CF5





ELEVATION CUT

PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

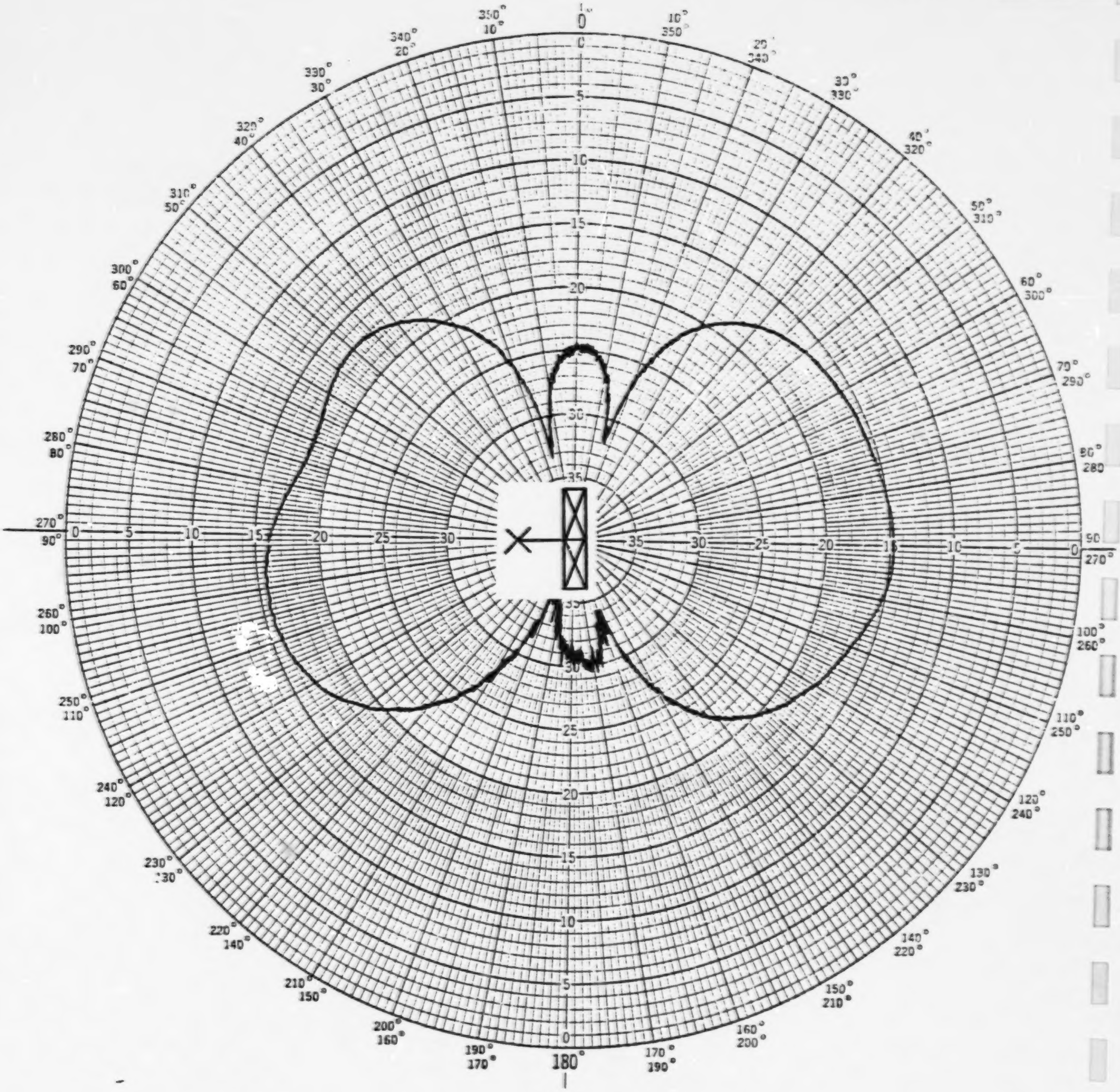
RING RADIUS: 47.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

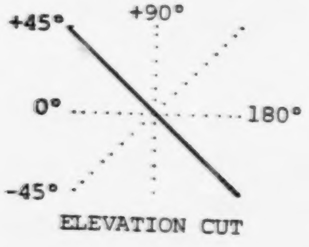
PATTERN NO.: CF6



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

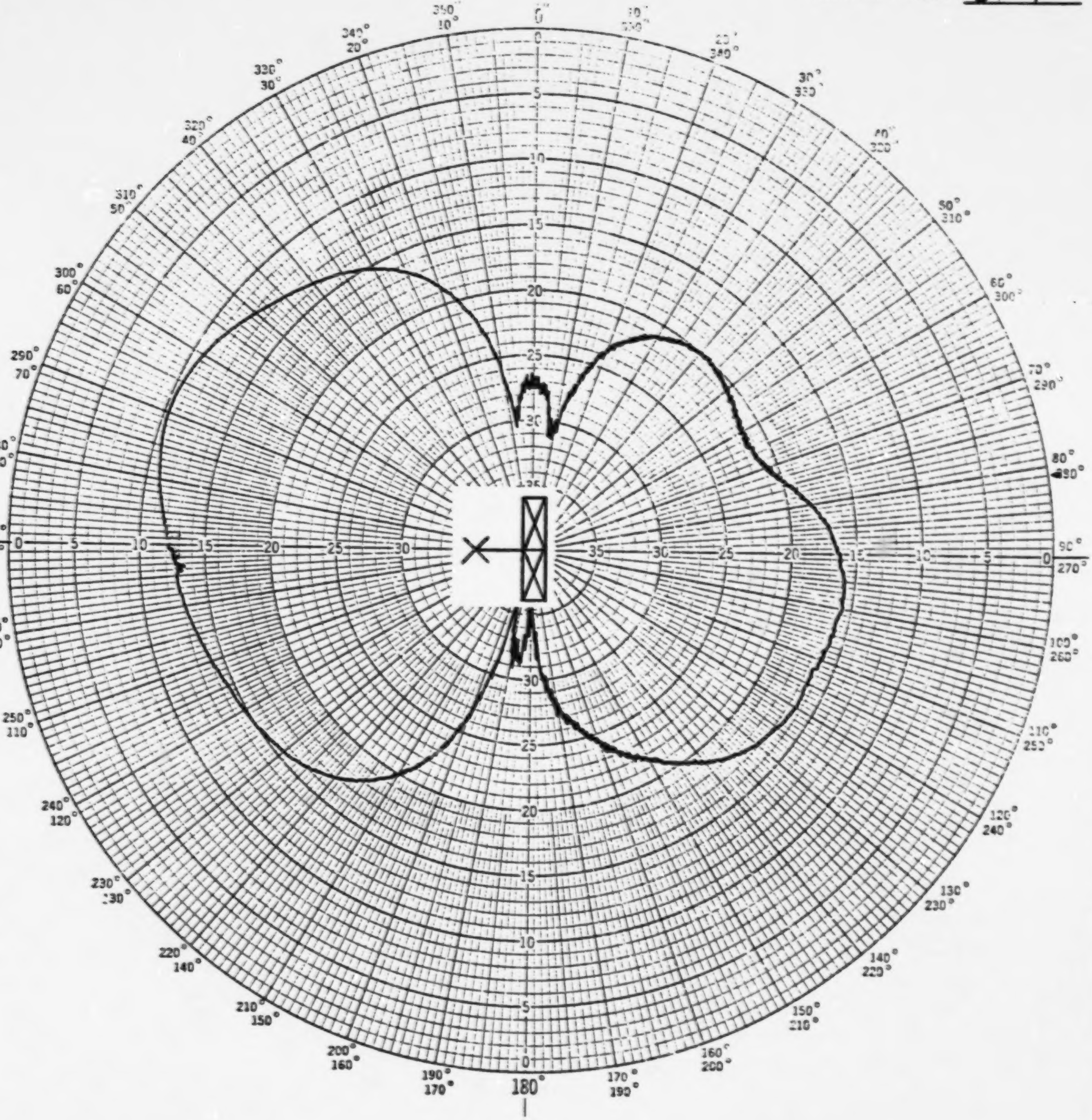
RING RADIUS: 47.5"

Micro
Communications
Inc.

DATE: 8/5/81

MODEL: C

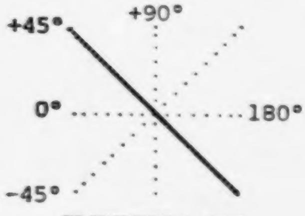
PATTERN NO.: CF7



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

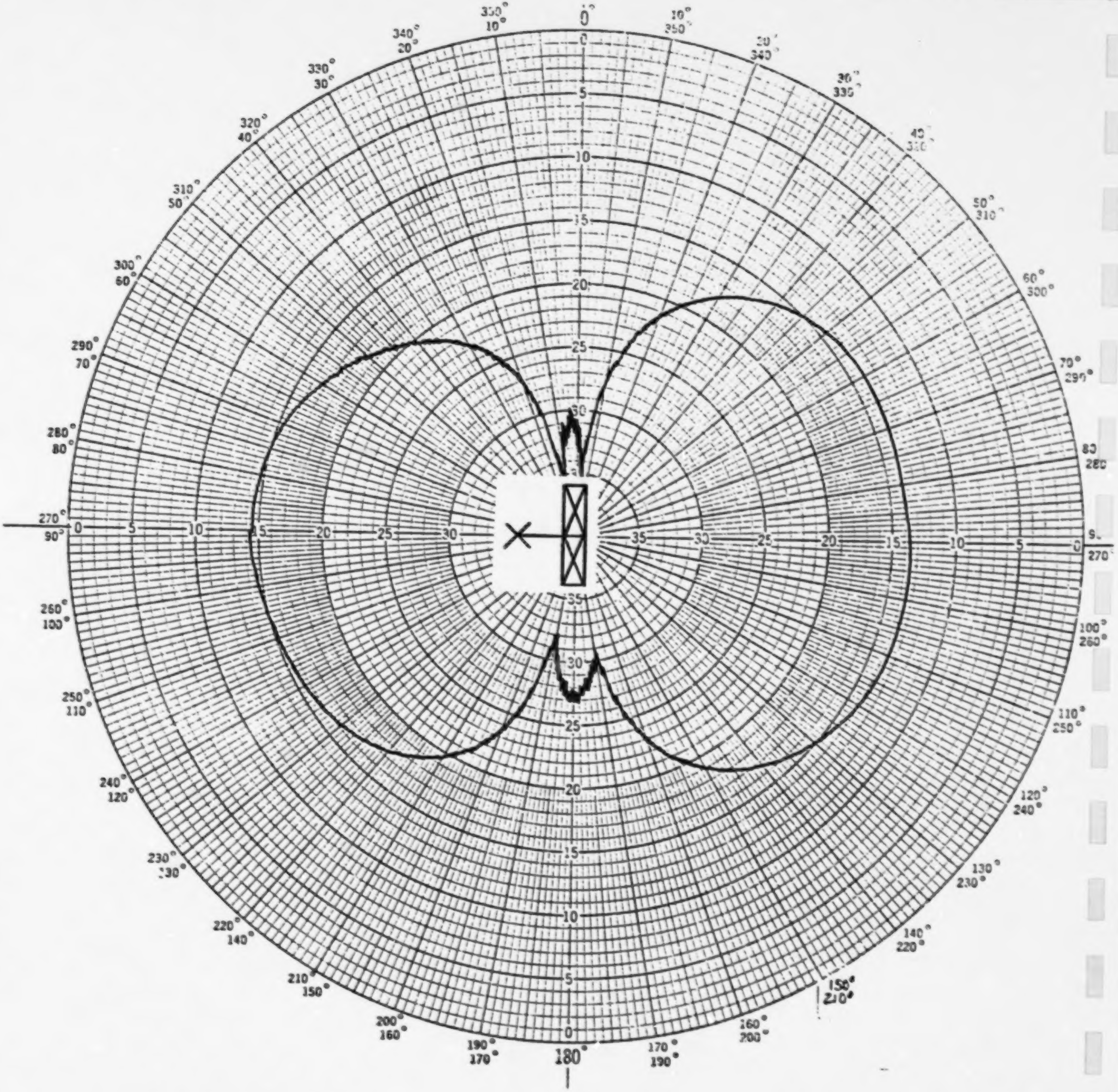
HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 47.5"

**Micro Communications Inc.**

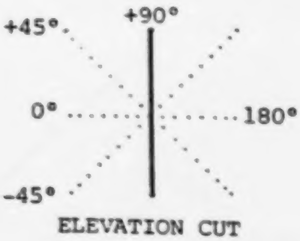
DATE: 8/5/81
MODEL: C
PATTERN NO.: CF8



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

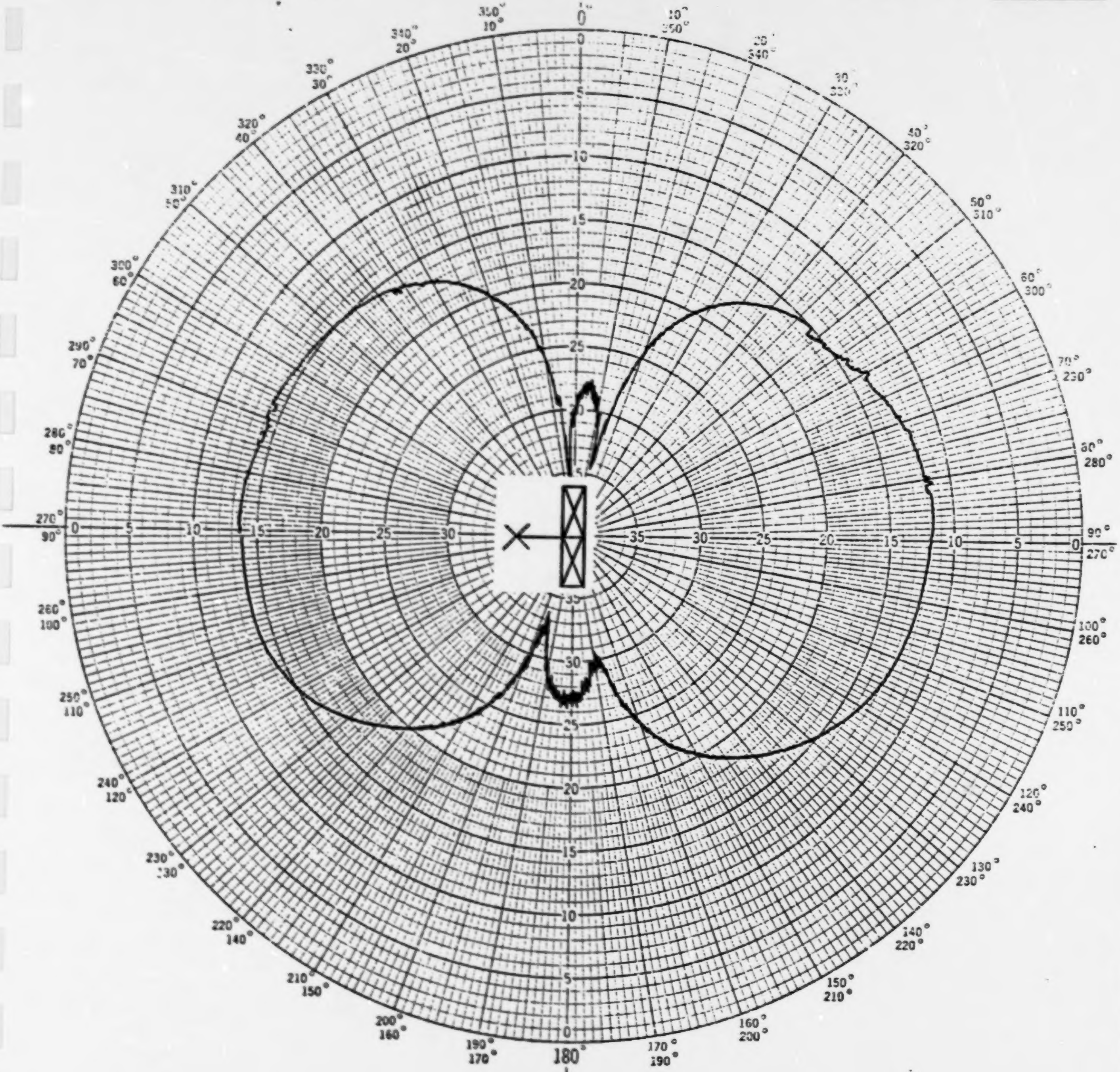
RING RADIUS: 47.5"

Micro
Communications
Inc.

DATE: 8/5/81

MODEL: C

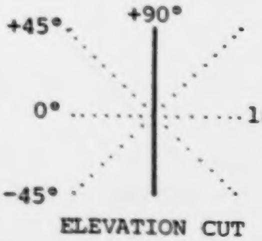
PATTERN NO.: CF9



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

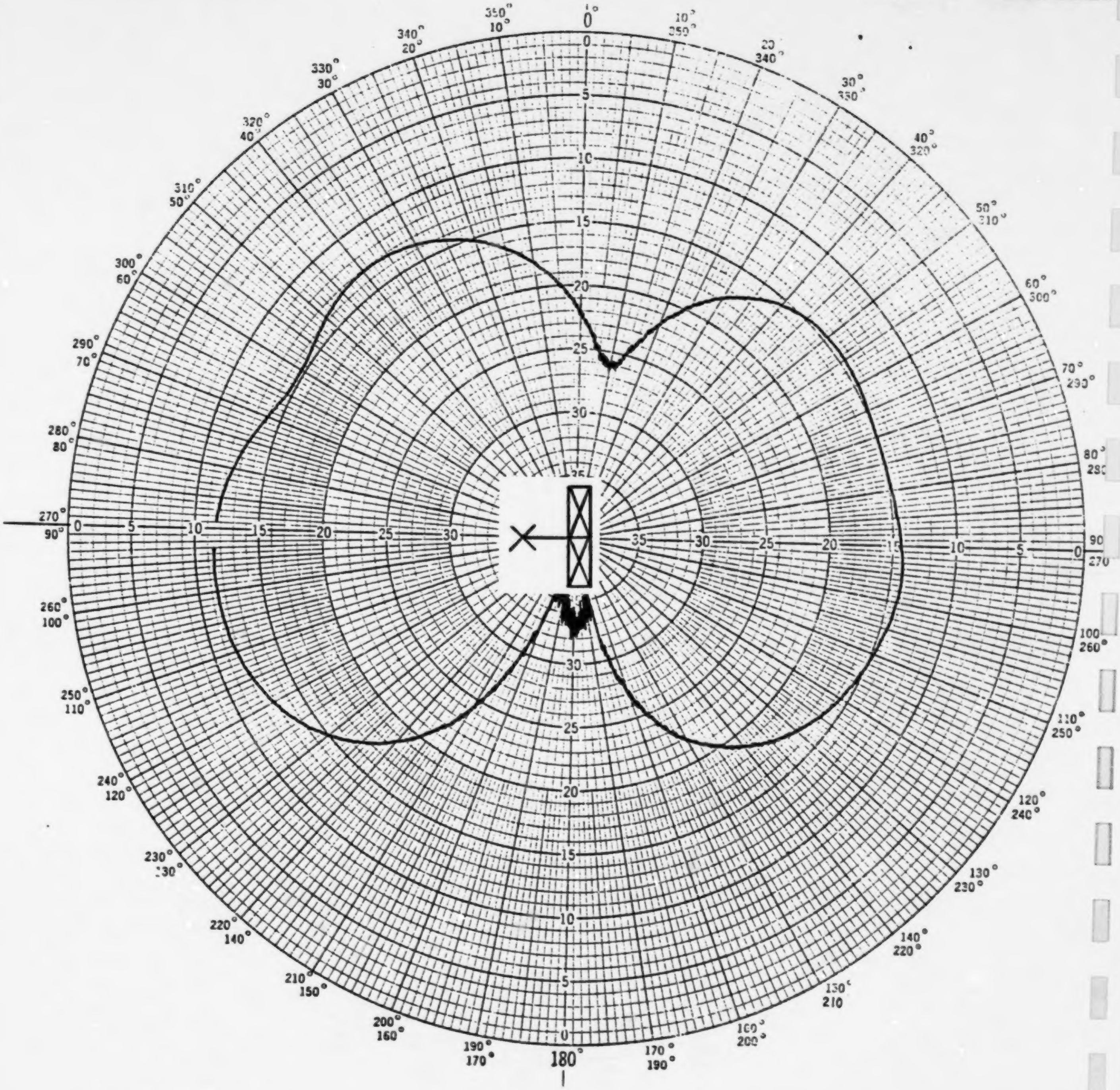
RING RADIUS: 47.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

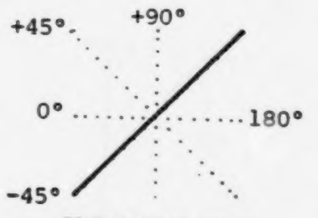
PATTERN NO.: CF10



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

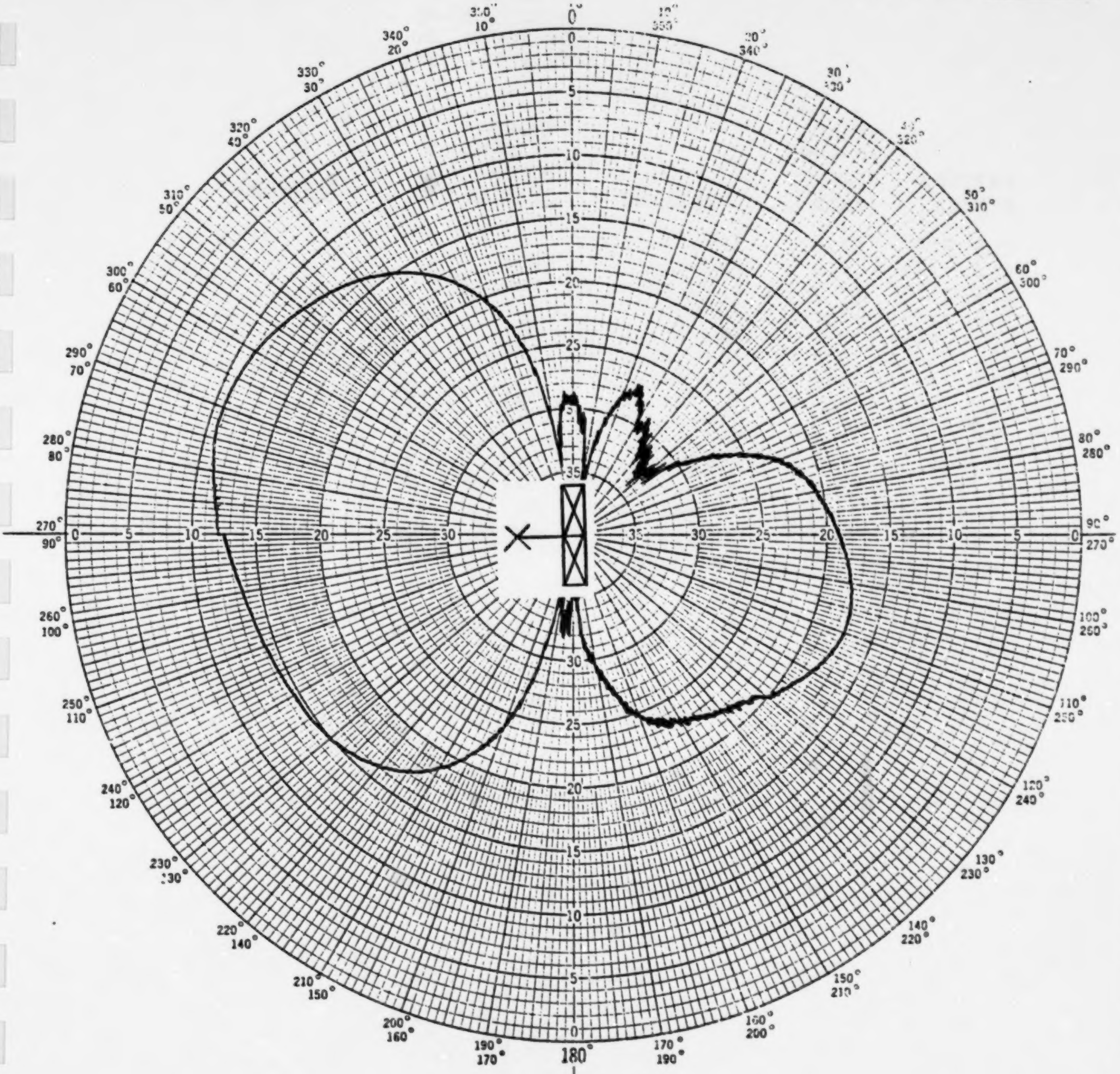
RING RADIUS: 47.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

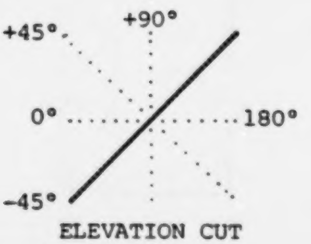
PATTERN NO.: CF11



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

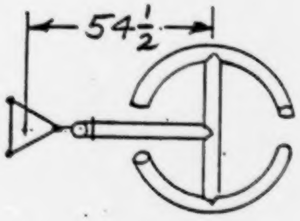
DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

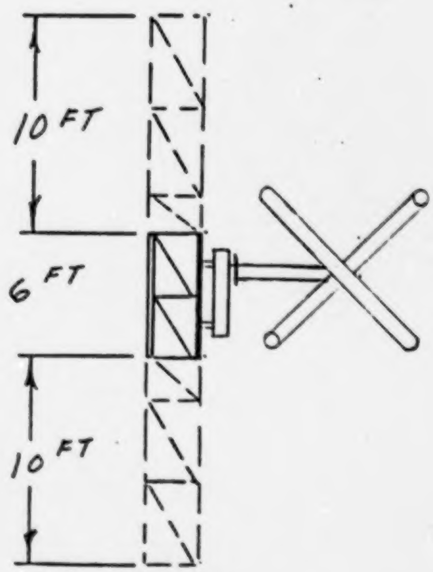
RING RADIUS: 47.5"

## MODEL "C"
## ANTENNA MOUNTED
## ON TOWER LEG
## July 30, 1981

| PATTERN NUMBER * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLARIZATION | REMARKS |
|---|---|---|---|---|
| CL1 (137) | 19.5 | Axial Ratio | | |
| CL2 (138) | 16.5 | Azimuth | Hoz. | |
| CL3 (139) | 19.5 | Azimuth | Vert. | |
| CL4 (140) | 19.5 | Azimuth | Hoz. | |
| CL5 (141) | 19.5 | Elevation | Hoz. | 0-180 cut |
| CL6 (142) | 19.5 | Elevation | Vert. | 0-180 cut |
| CL7 (143) | 19.5 | Elevation | Hoz. | +45 cut |
| CL8 (144) | 19.5 | Elevation | Vert. | +45 cut |
| CL9 (145) | 19.5 | Elevation | Hoz. | +90 cut |
| CL10 (146) | 19.5 | Elevation | Vert. | +90 cut |
| CL11 (147) | 19.5 | Elevation | Hoz. | -45 cut |
| CL12 (148) | 19.5 | Elevation | Vert. | -45 cut |
| CL13 (149) | 19.5 | Elevation | Hoz. | 0-180, tower extended to 26' |
| CL14 (150) | 19.5 | Elevation | Vert. | 0-180, tower extended to 26' |

*Page Numbers



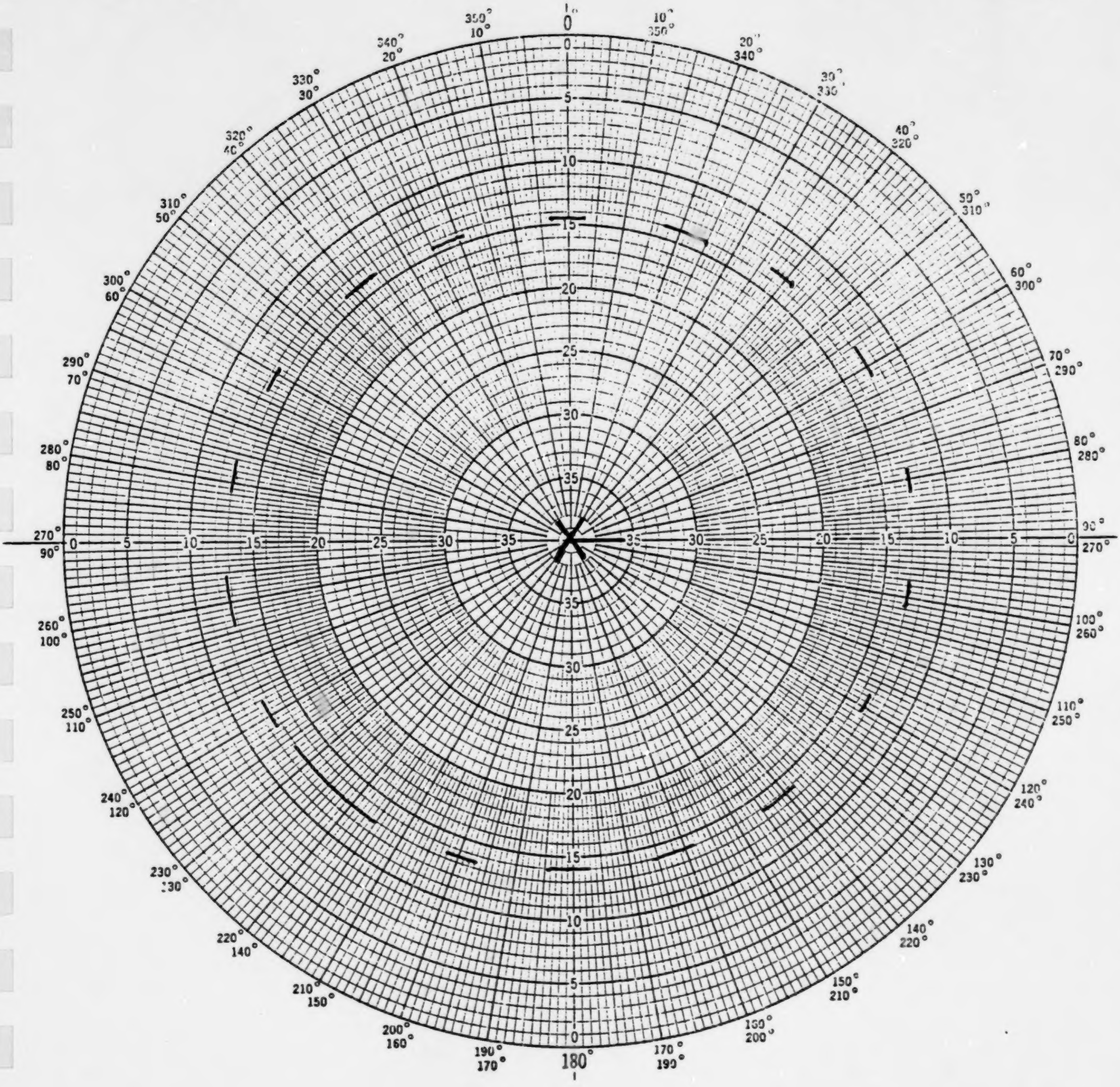


**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

PATTERN NO.: CL1



PATTERN: AXIAL RATIO

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: ______

HEIGHT OF TRANSMITTING
ANTENNA: 19.5

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

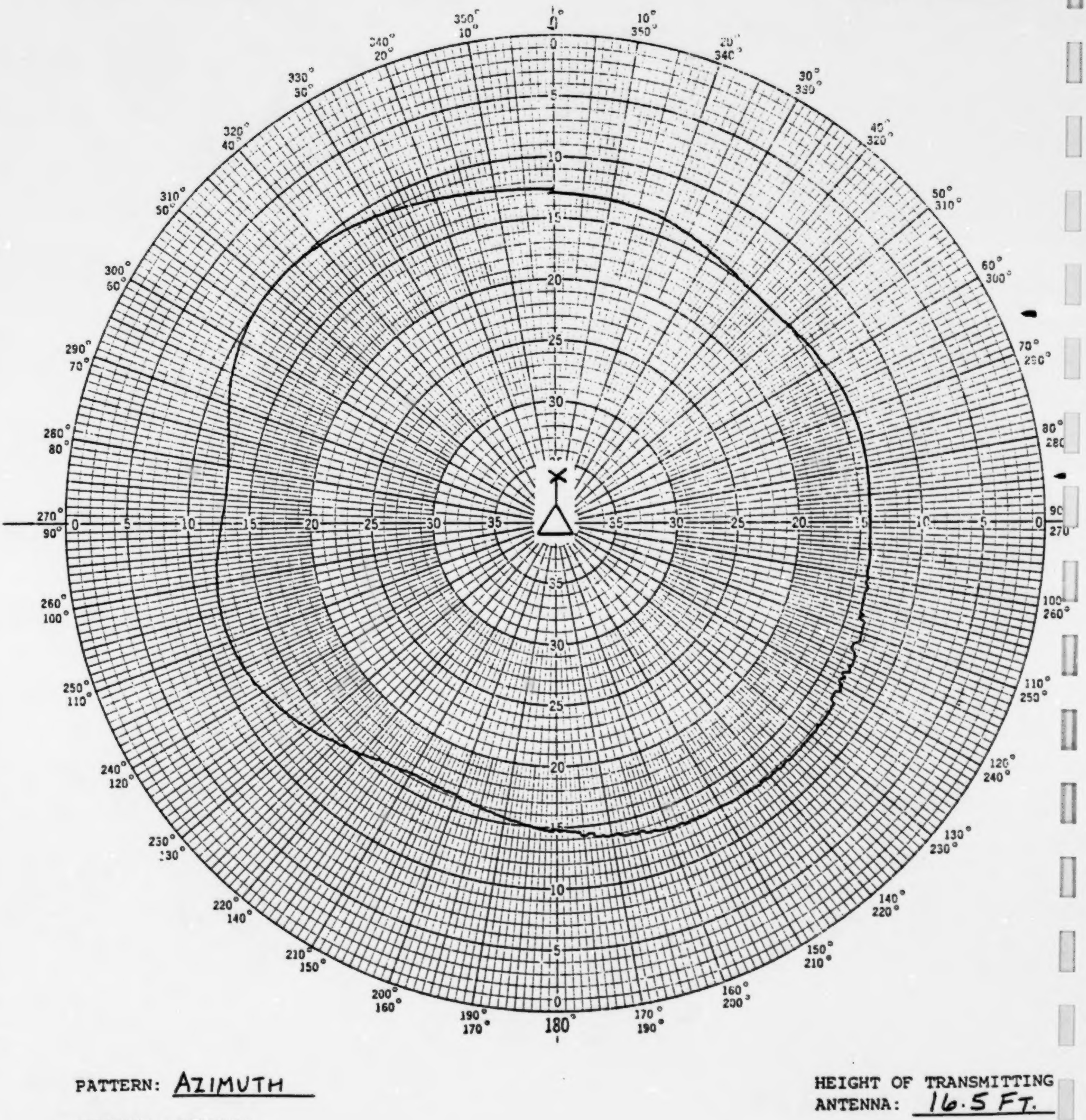
RING RADIUS: 54.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

PATTERN NO.: CL2



PATTERN: AZIMUTH

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.

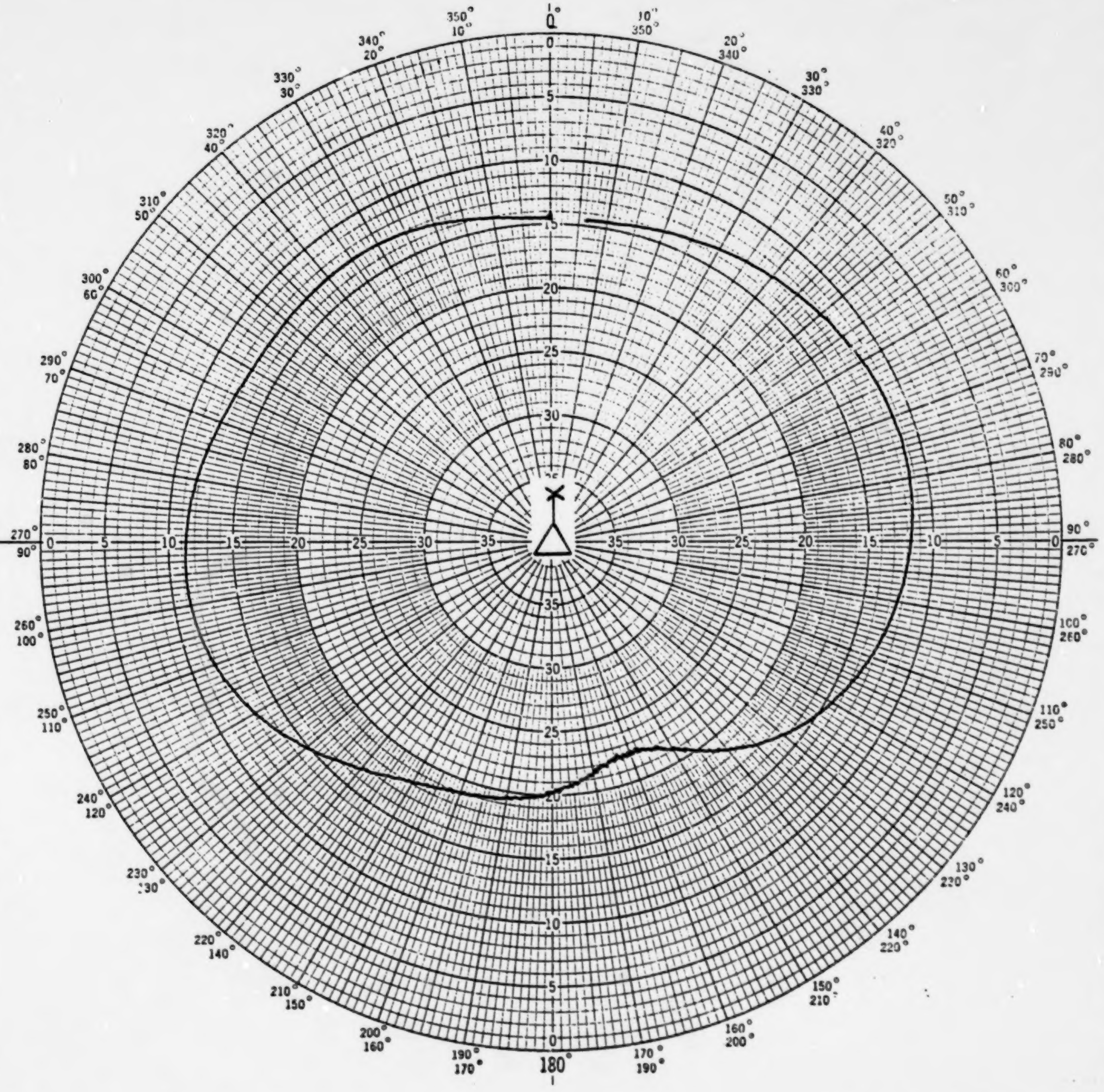
HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT

RING RADIUS: 54.5"

Micro
Communications
Inc.

DATE: 8/5/81
MODEL: C
PATTERN NO.: CL3



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19.5

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

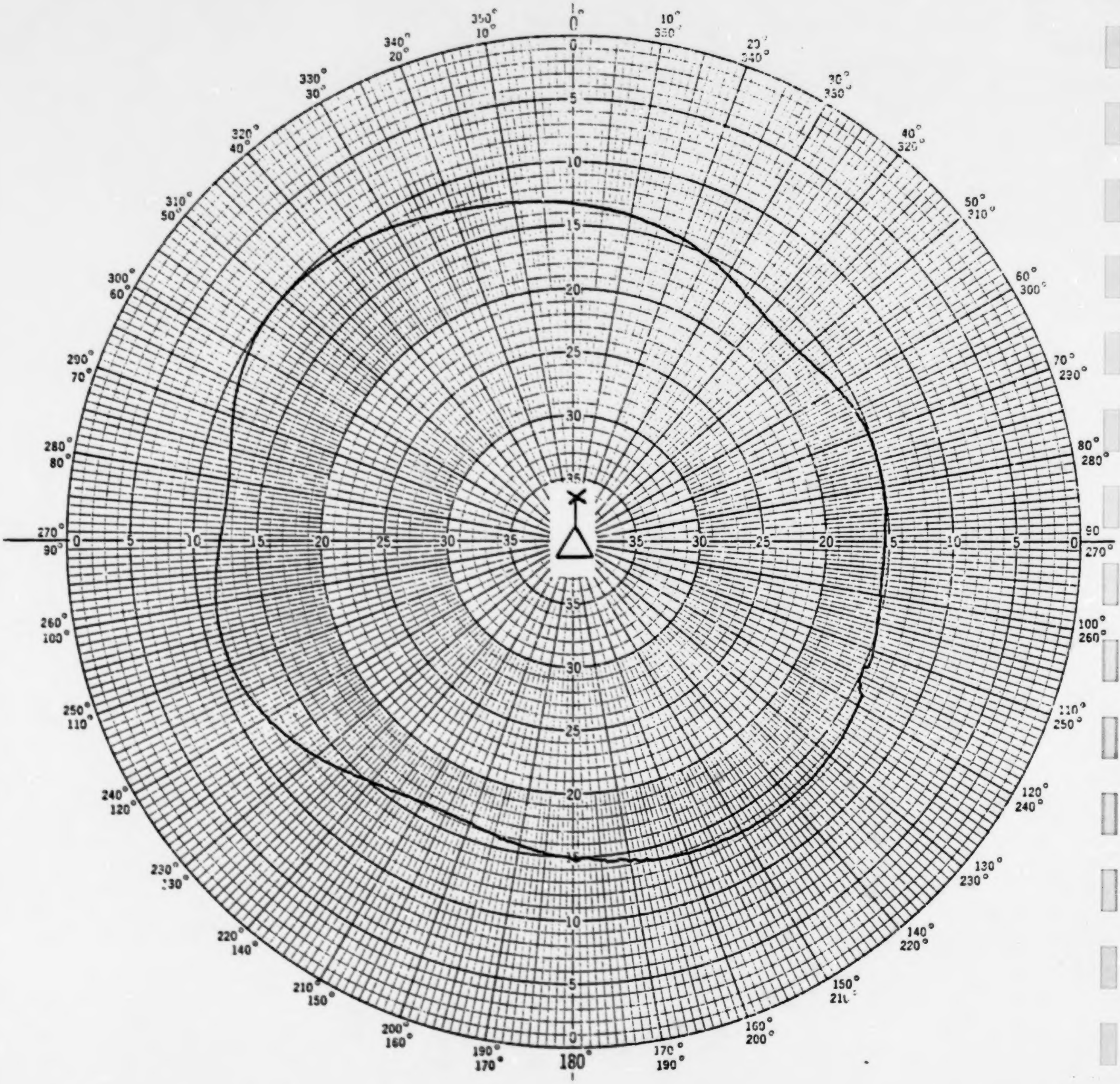
RING RADIUS: 54.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

PATTERN NO.: CL4



PATTERN: AZIMUTH

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT

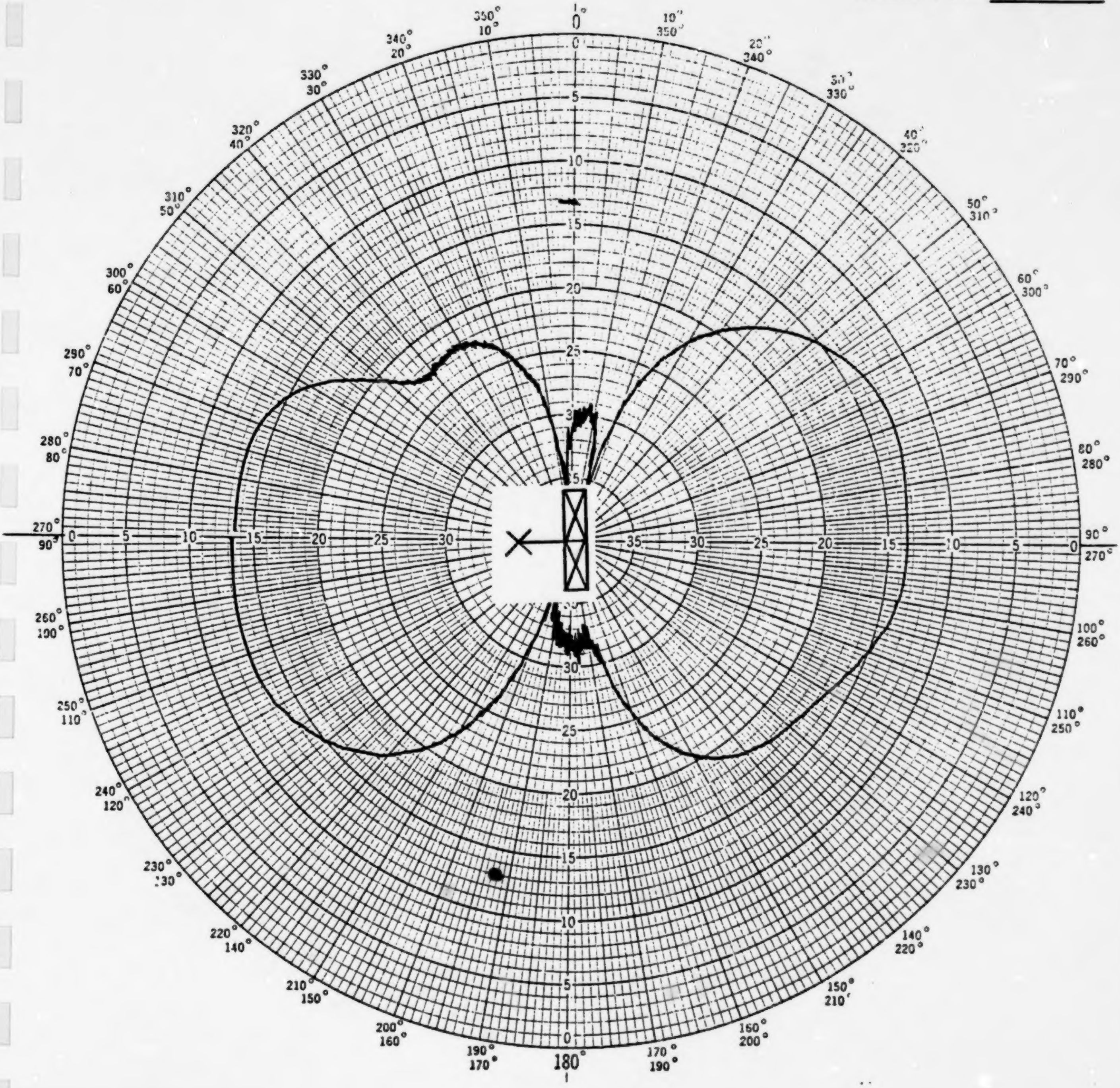
RING RADIUS: 54.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

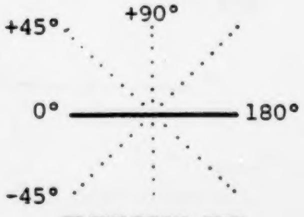
PATTERN NO.: CL5



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

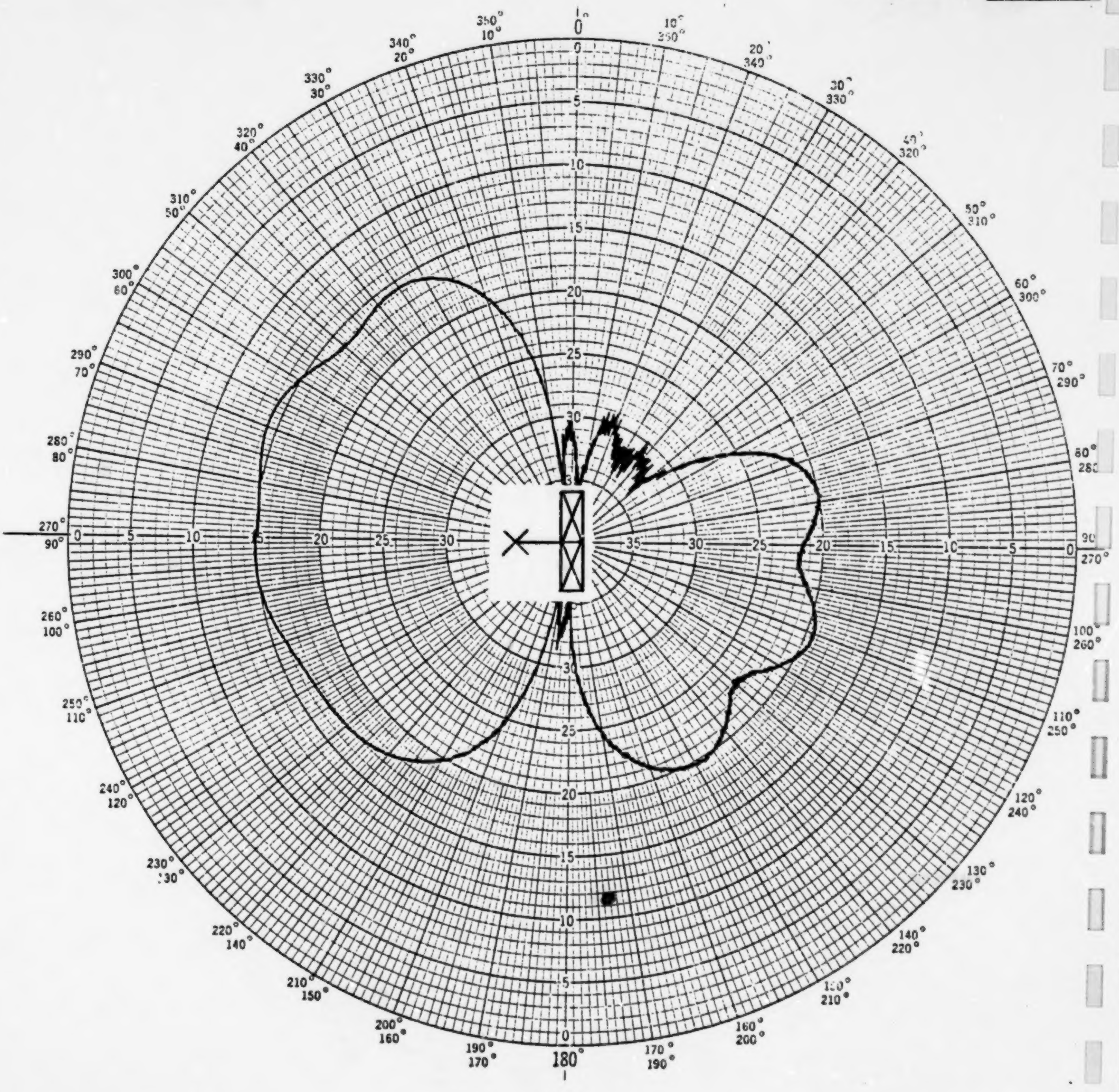
HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

RING RADIUS: 54.5"

**Micro Communications Inc.**

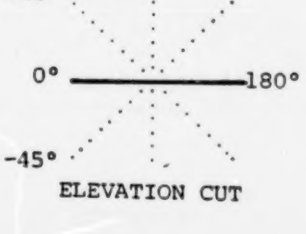
DATE: 8/5/81
MODEL: C
PATTERN NO.: CL6



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

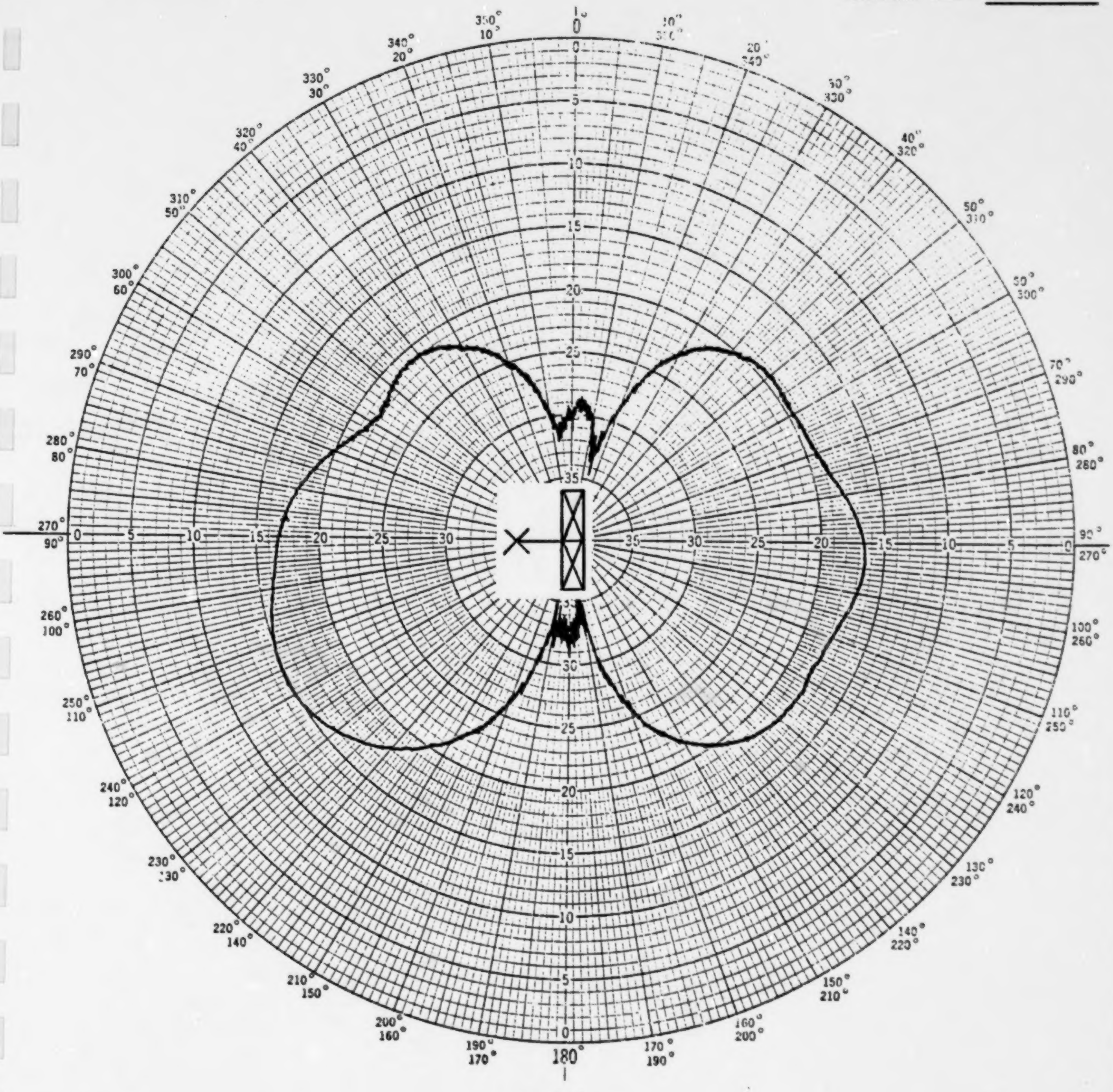
RING RADIUS: 54.5"

MCi Micro Communications Inc.

DATE: 8/5/81

MODEL: C

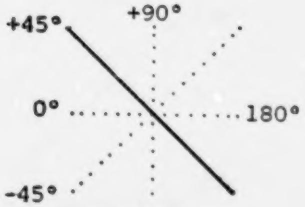
PATTERN NO.: CL7



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

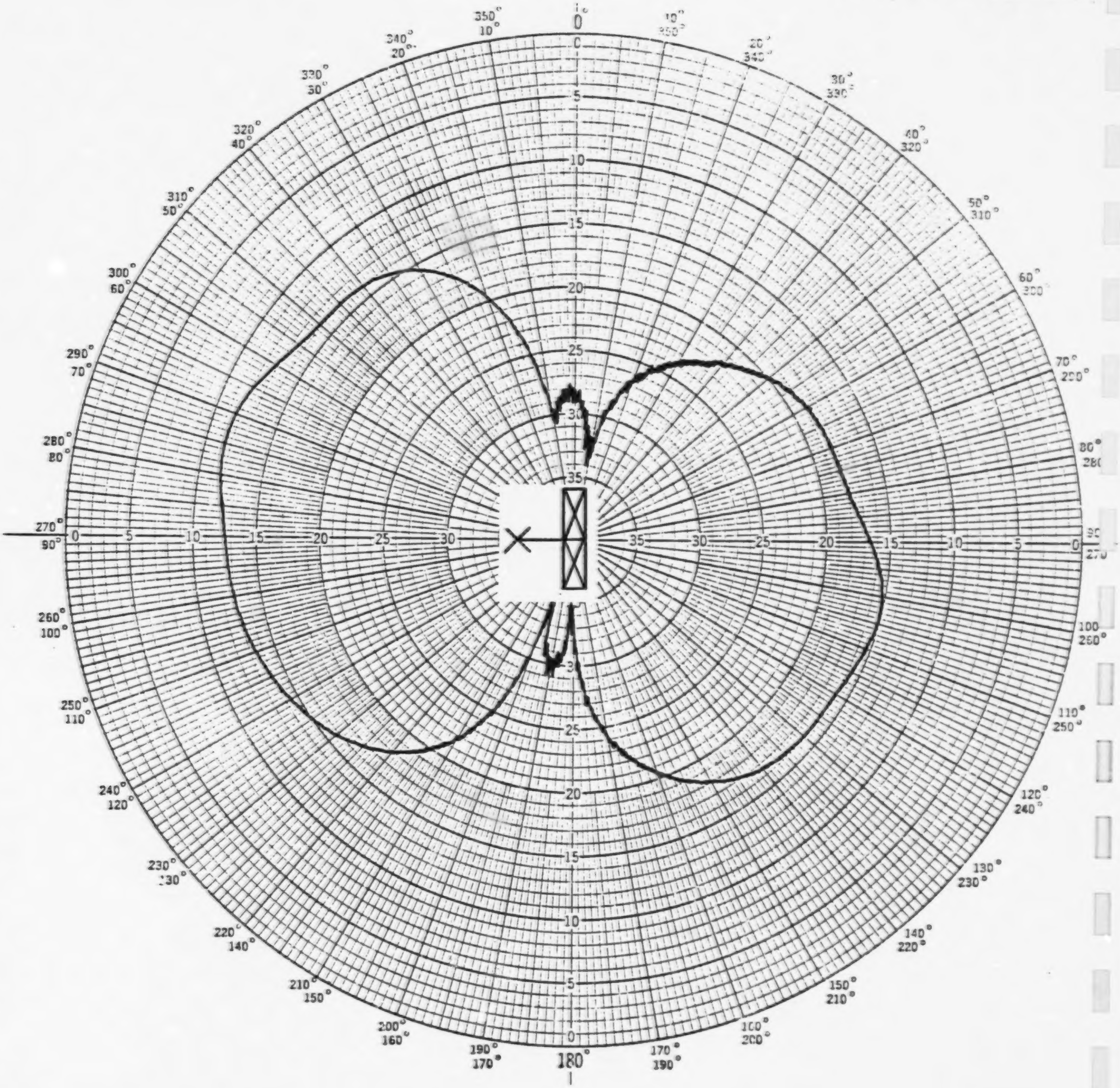
RING RADIUS: 54.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

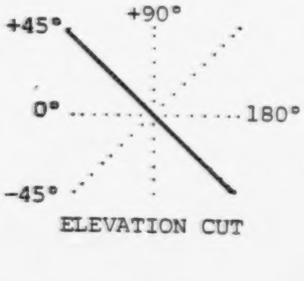
PATTERN NO.: CL8



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

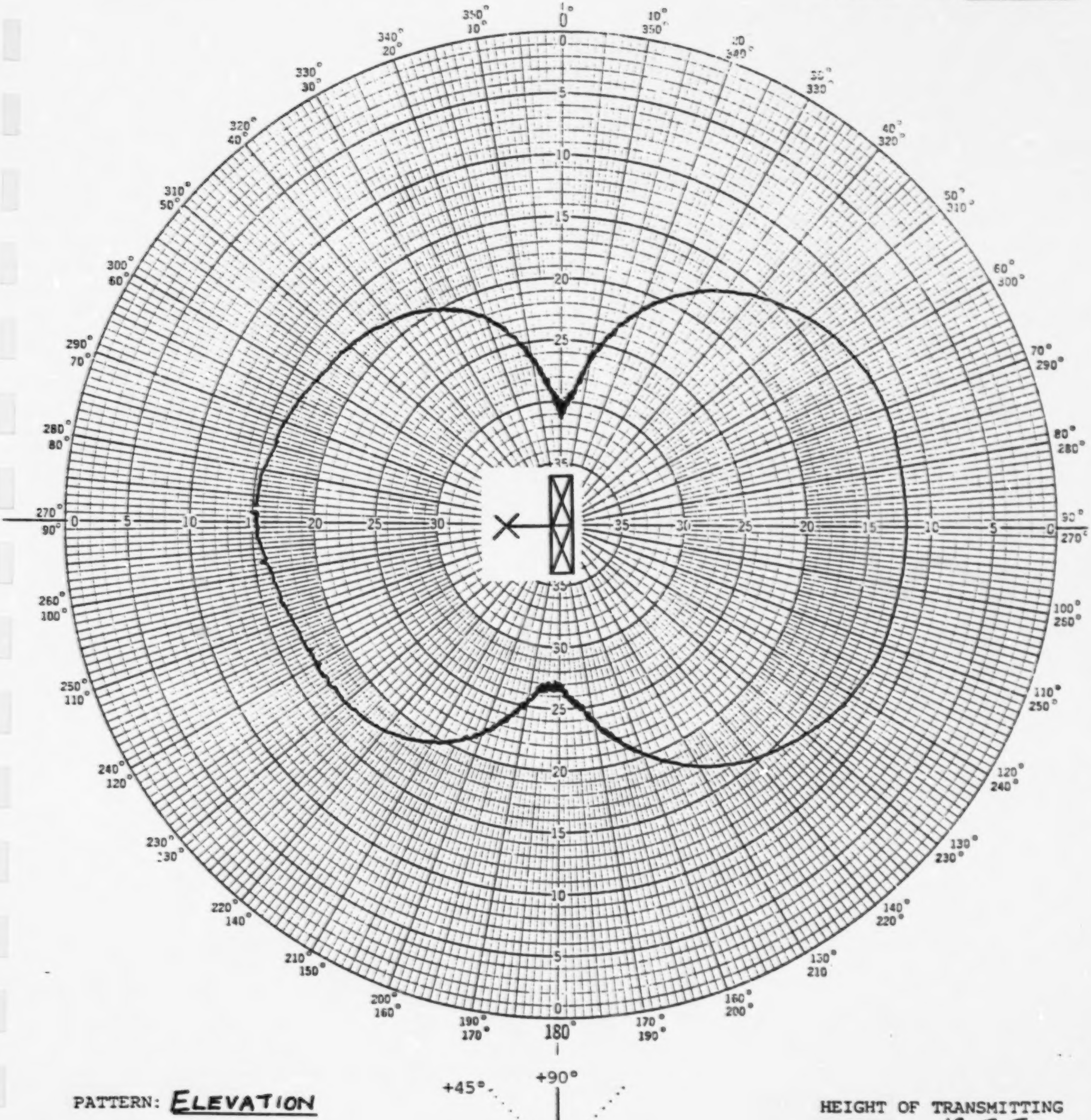
RING RADIUS: 54.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

PATTERN NO.: CL9



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.

+90°
+45°
0°
180°
-45°

ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

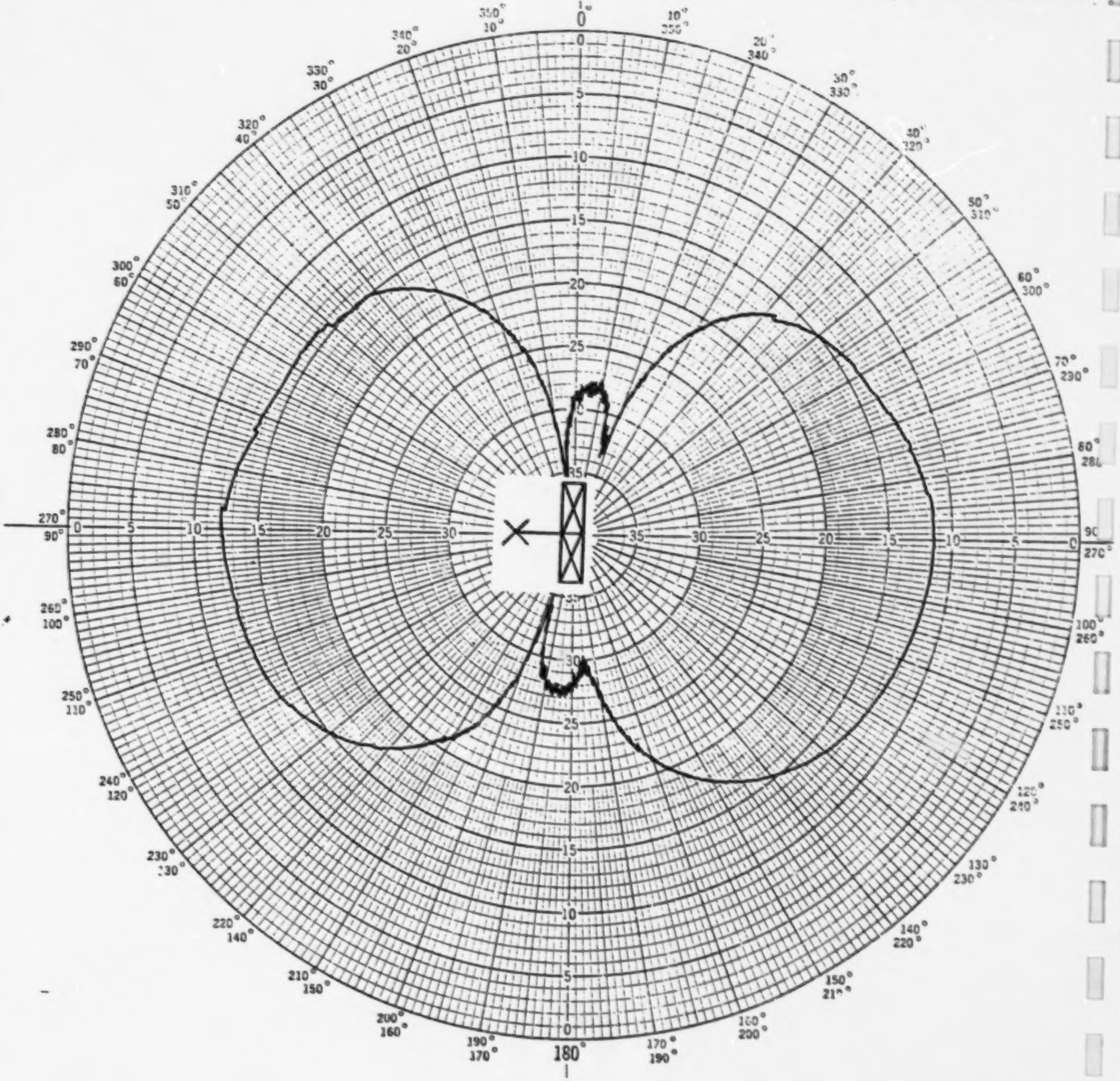
RING RADIUS: 54.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

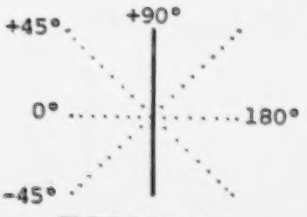
PATTERN NO.: CL10



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

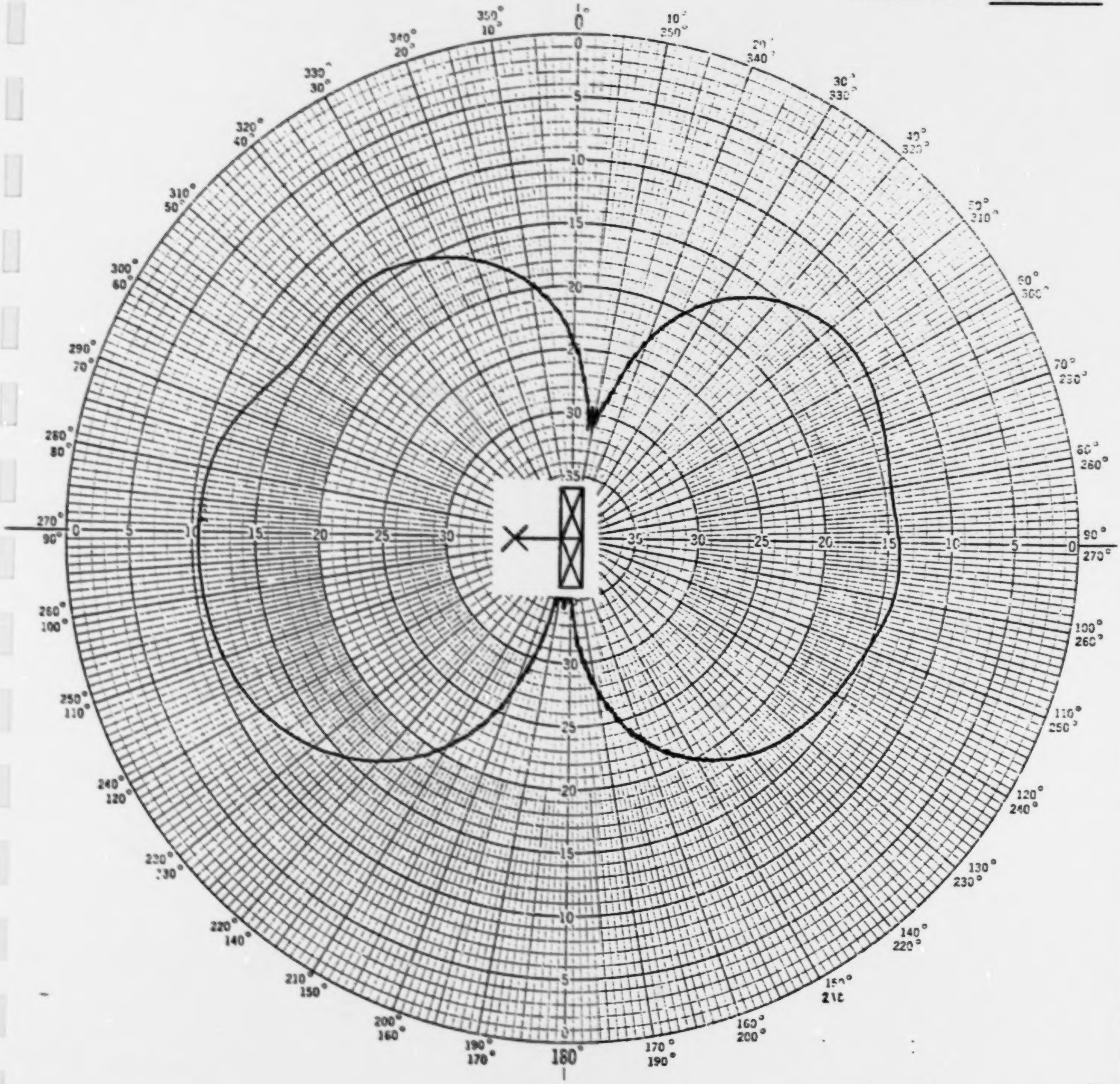
RING RADIUS: 54.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

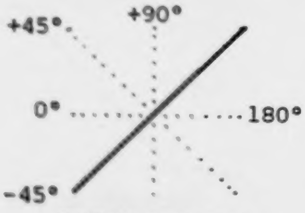
PATTERN NO.: CL11



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

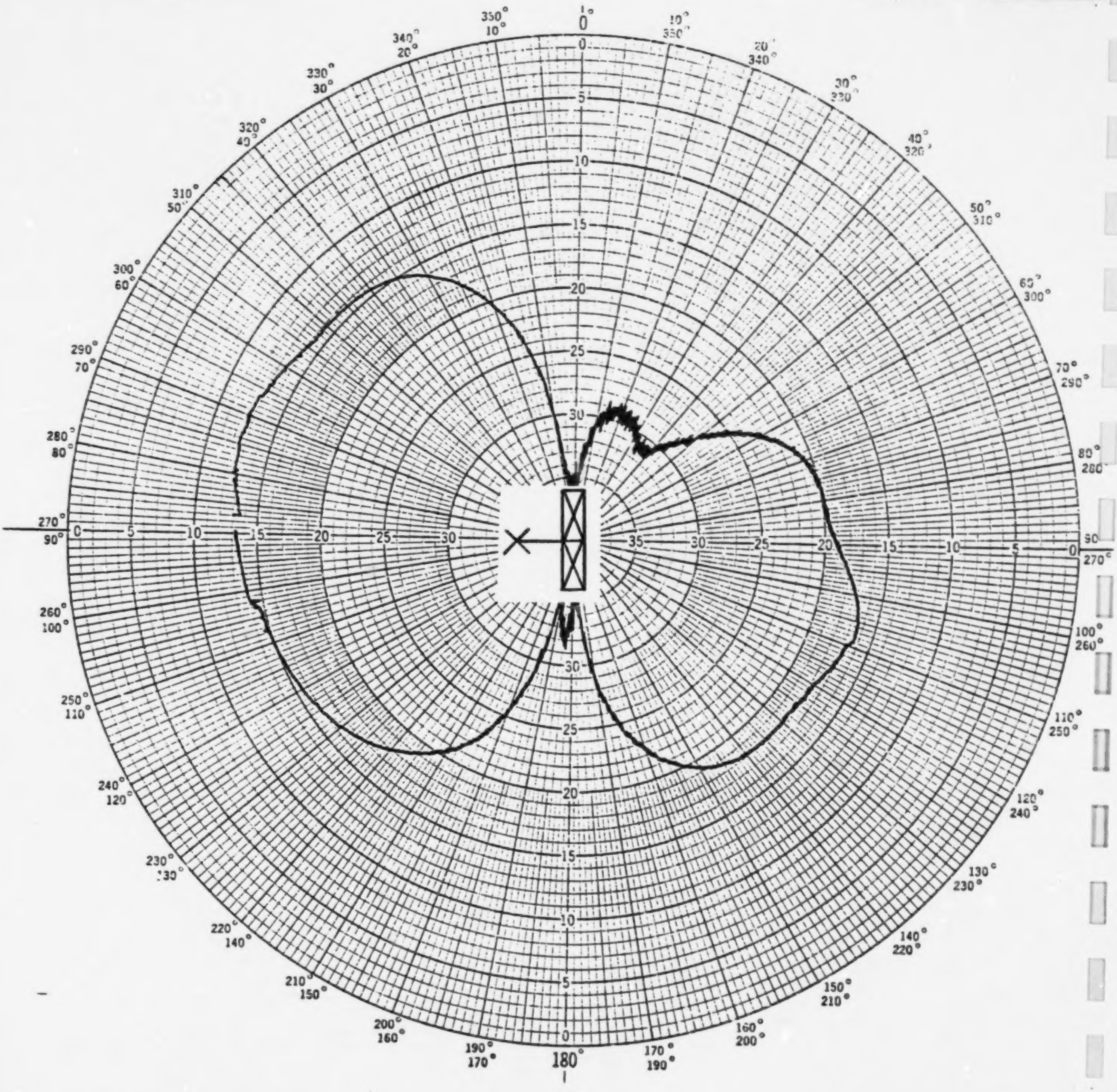
RING RADIUS: 54.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

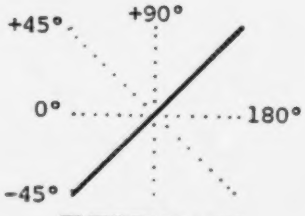
PATTERN NO.: CL12



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

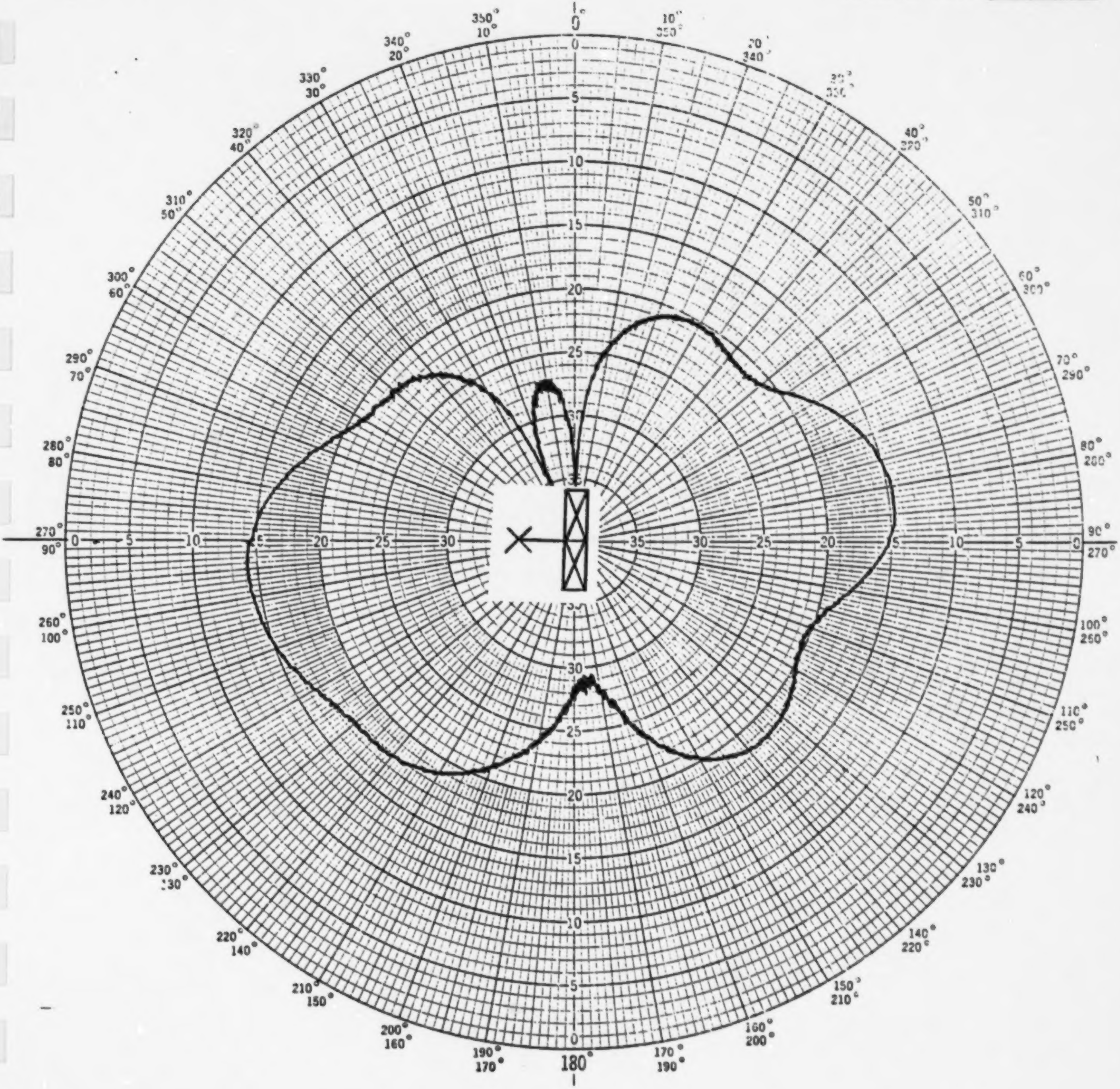
RING RADIUS: 54.5"

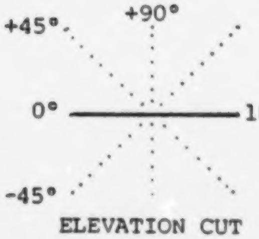
**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

PATTERN NO.: CL13





PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

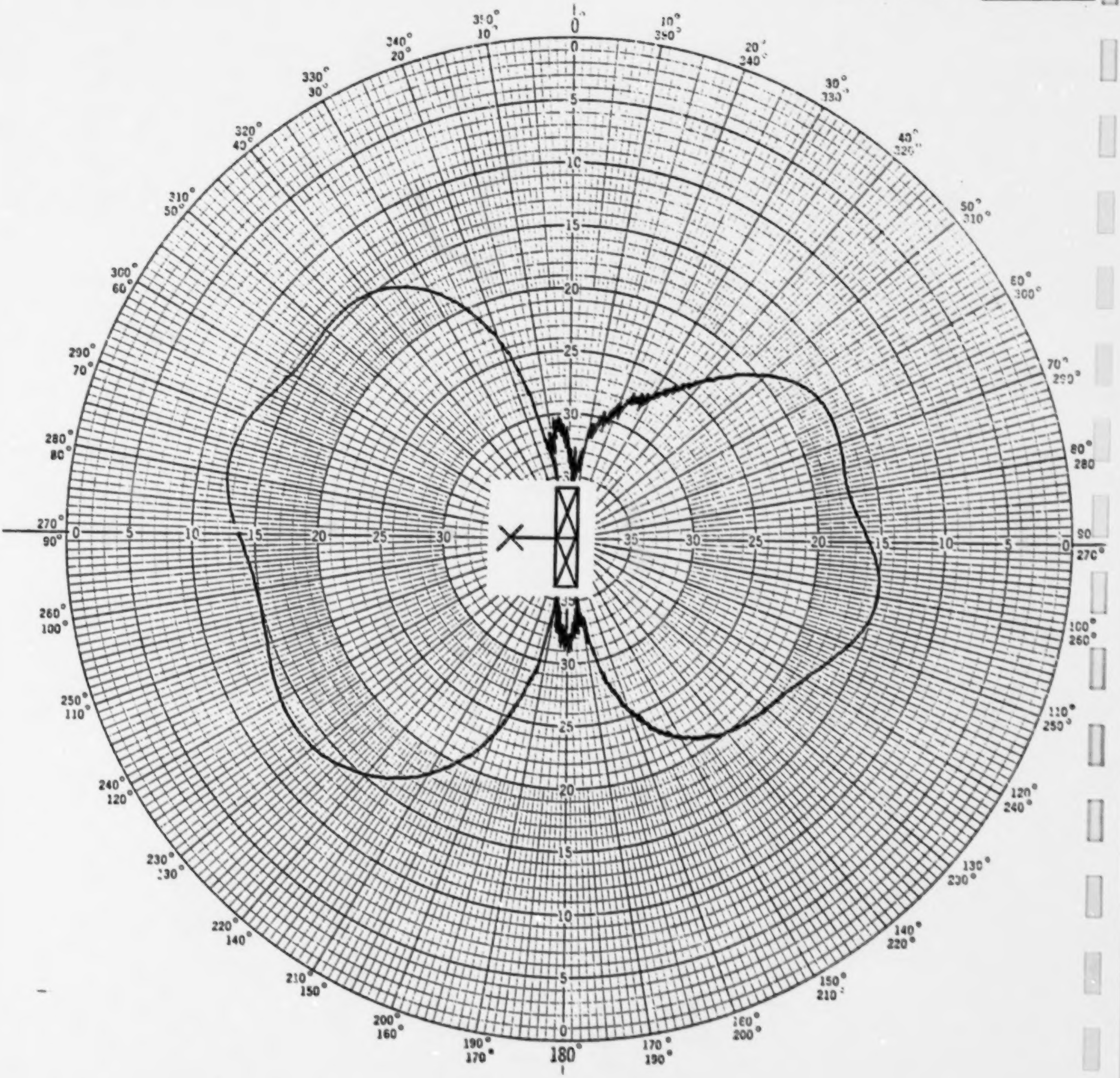
RING RADIUS: 54.5"

**Micro Communications Inc.**

DATE: 8/5/81

MODEL: C

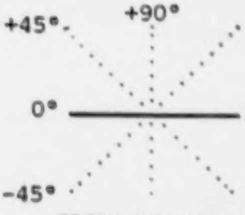
PATTERN NO.: CL14



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 19.5 FT.

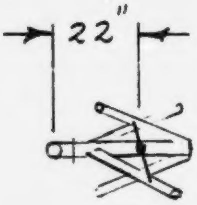
DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

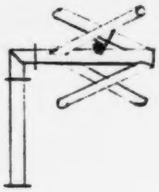
RING RADIUS: 54.5"

# MODEL "D"
# FREE SPACE MEASUREMENTS
July 31, 1981

| PATTERN NUMBER | * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLAR-IZATION | REMARKS |
|---|---|---|---|---|---|
| DFS25 | (152) | 22.5 | Azimuth | Hoz. | Axial Ratio = 5 db |
| DFS26 | (153) | 22.5 | Azimuth | Vert. | Axial Ratio = 5 db |
| DFS27 | (154) | 19.0 | Axial Ratio | | |
| DFS28 | (155) | 19.0 | Azimuth | Hoz. | |
| DFS29 | (156) | 19.0 | Azimuth | Vert. | |
| DFS30 | (157) | 19.0 | Elevation | Hoz. | 0-180 cut |
| DFS31 | (158) | 19.0 | Elevation | Vert. | 0-180 cut |
| DFS32 | (159) | 19.0 | Elevation | Hoz. | +45 cut |
| DFS33 | (160) | 19.0 | Elevation | Vert. | +45 cut |
| DFS34 | (161) | 19.0 | Elevation | Hoz. | +90 cut |
| DFS35 | (162) | 19.0 | Elevation | Vert. | +90 cut |
| DFS36 | (163) | 19.0 | Elevation | Hoz. | -45 cut |
| DFS37 | (164) | 19.0 | Elevation | Vert. | -45 cut |

*Page Numbers



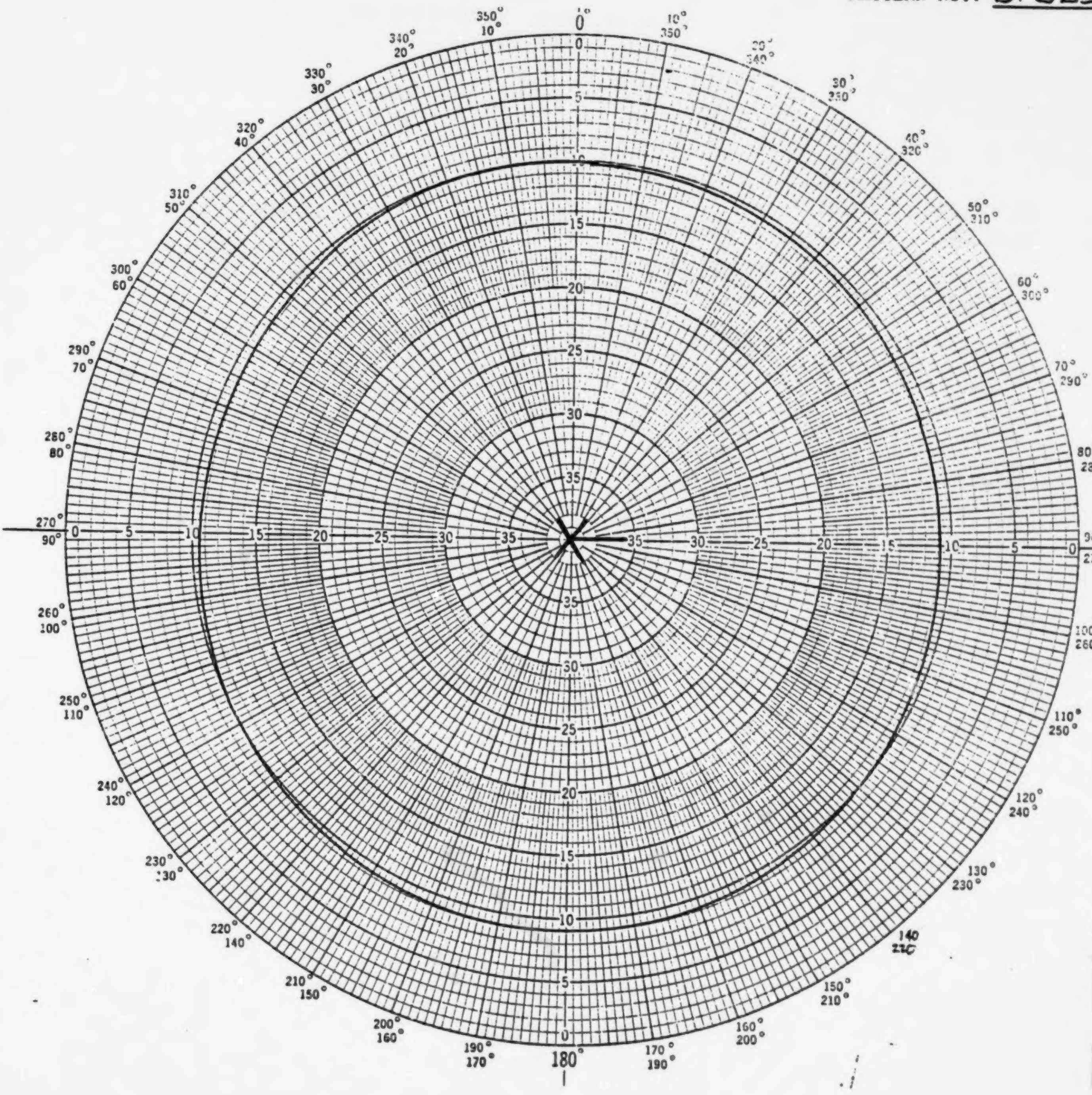


**Micro Communications Inc.**

DATE: 7/31/81

MODEL: D

PATTERN NO.: DFS25



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 22.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

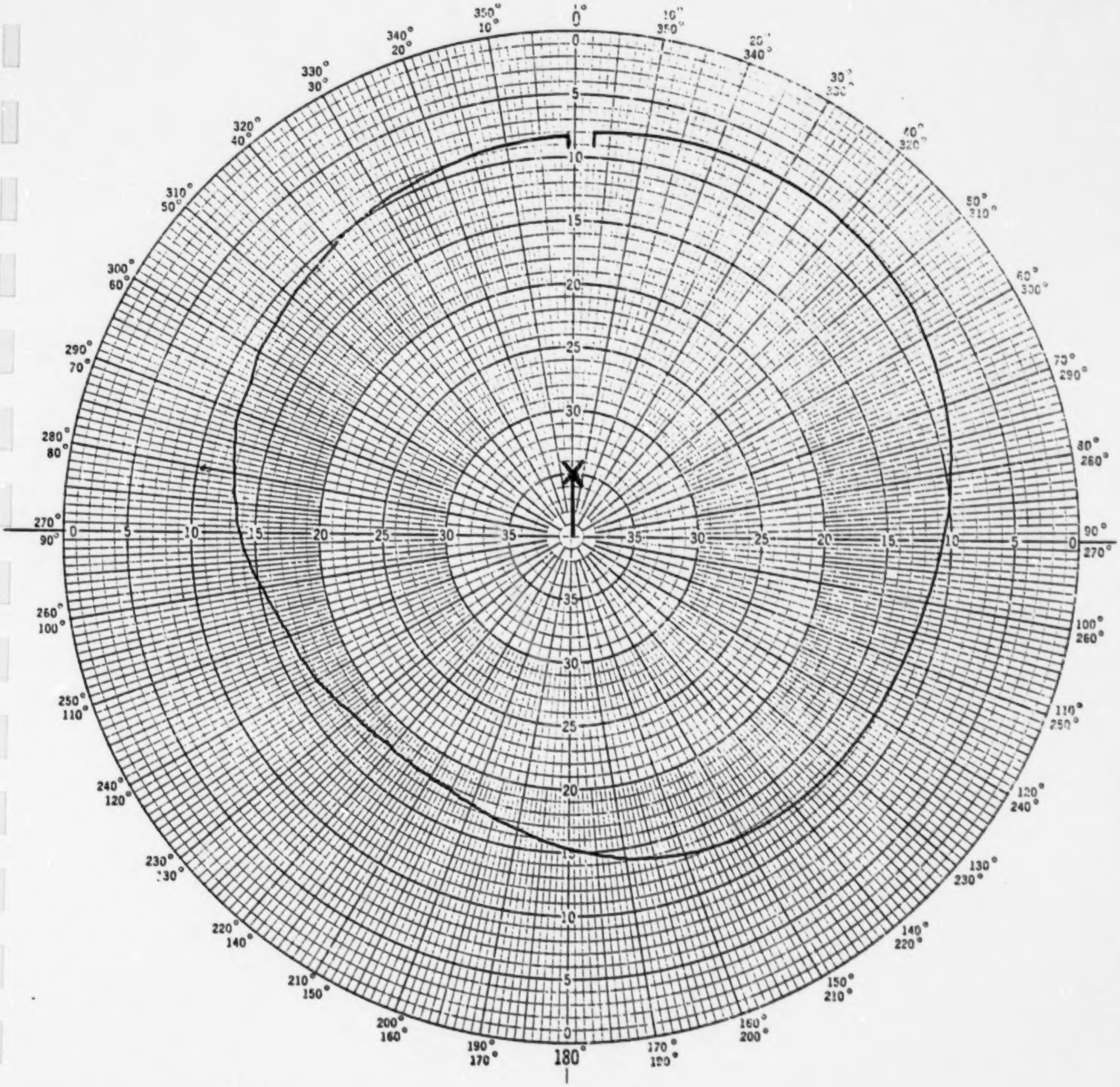
RING RADIUS: 22.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: D

PATTERN NO.: DFS26



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 22.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

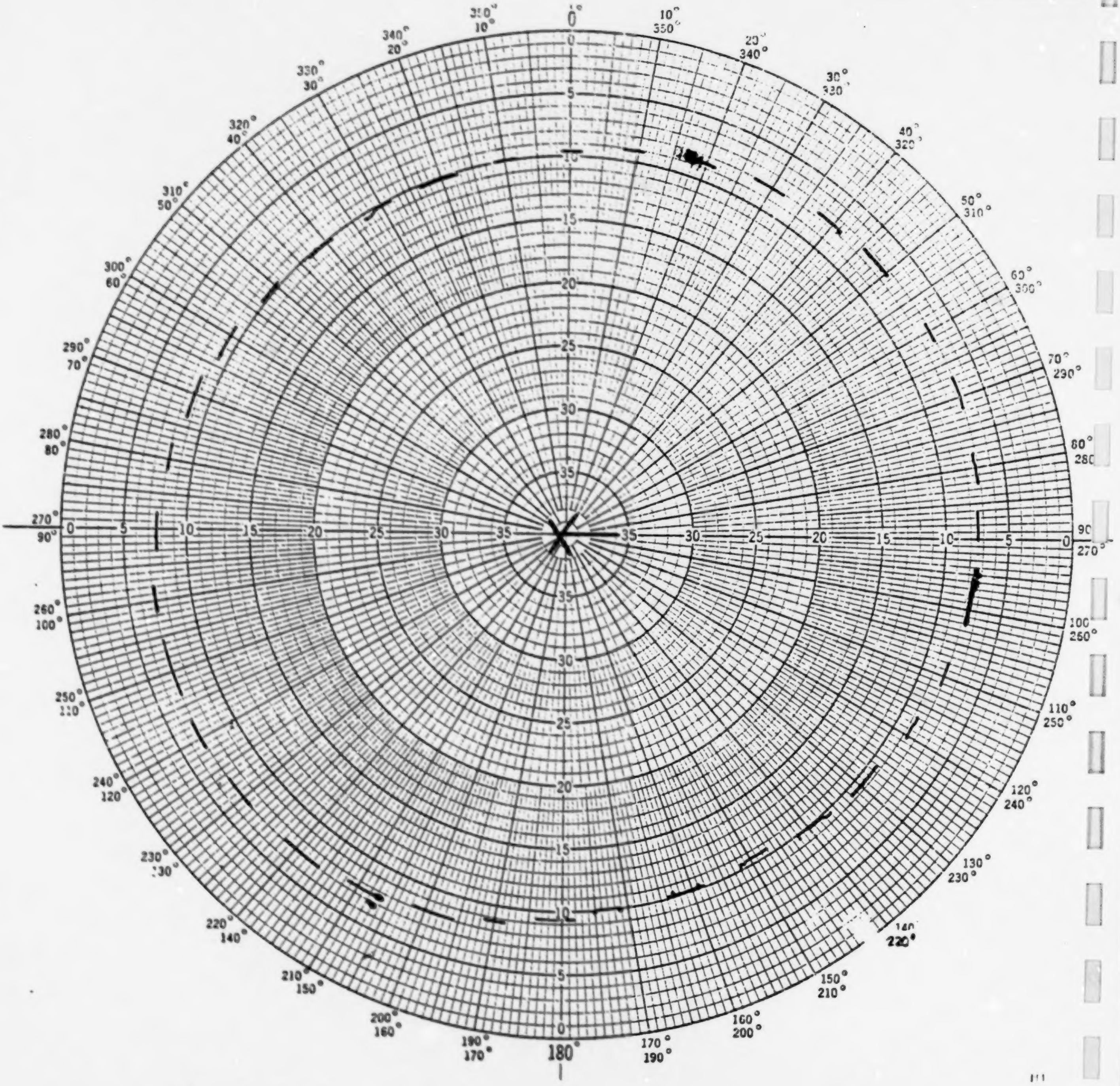
RING RADIUS: 22.5"

Micro
Communications
Inc.

DATE: 7/31/81

MODEL: D

PATTERN NO.: DFS27



PATTERN: AXIAL RATIO

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: ________

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

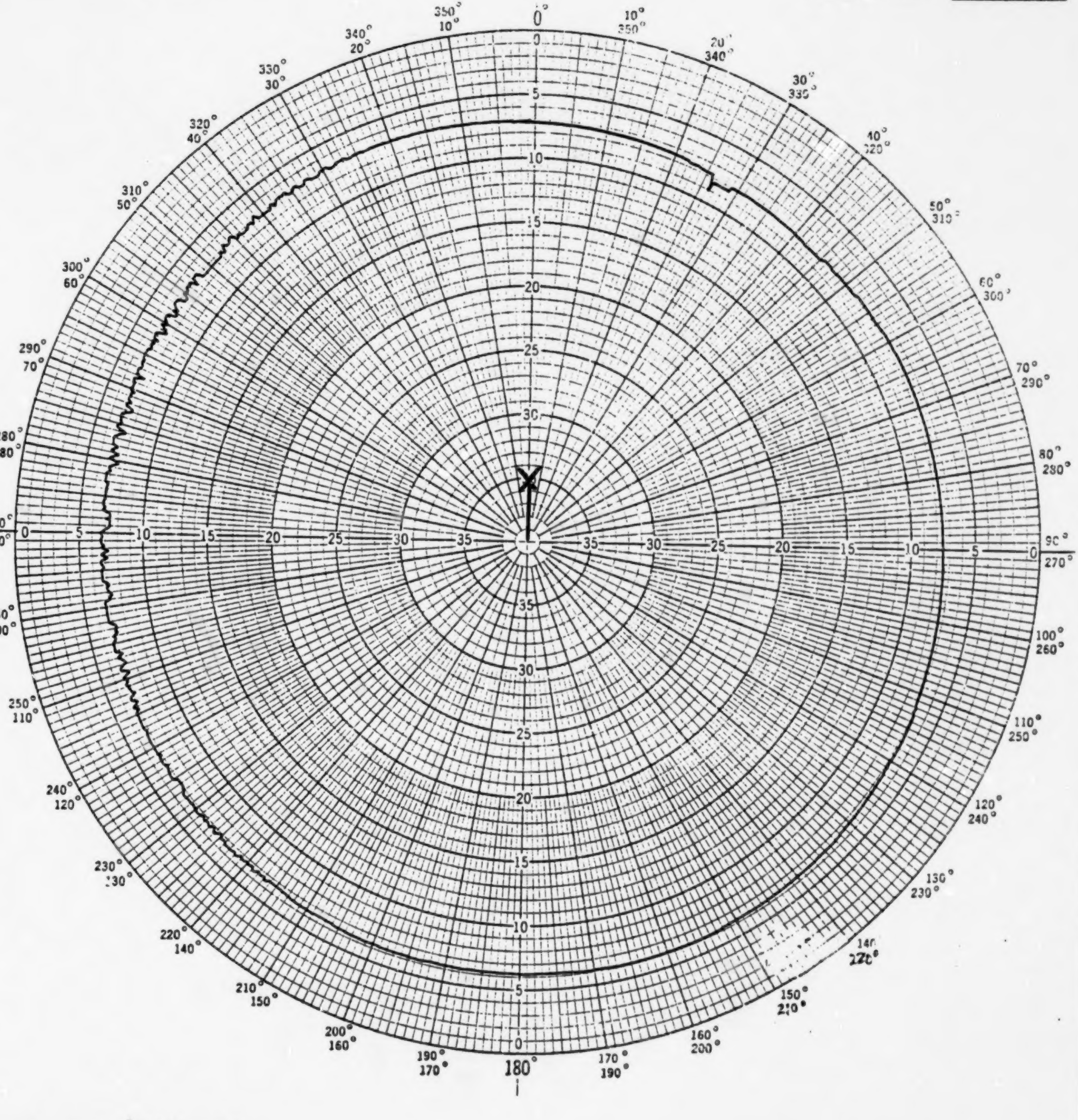
RING RADIUS: 22.5"

Micro Communications Inc.

DATE: 7/31/81

MODEL: D

PATTERN NO.: DFS28



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

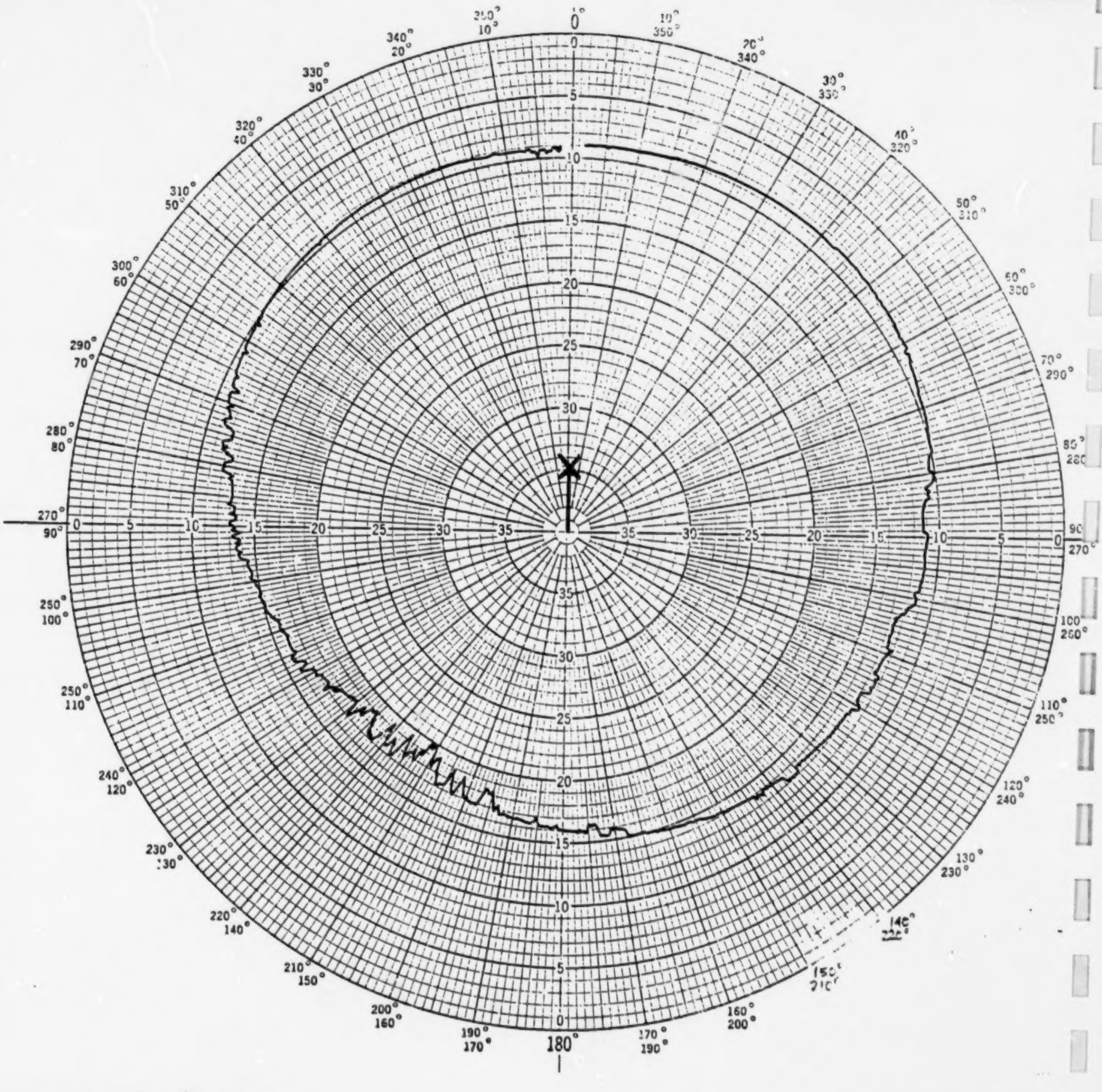
RING RADIUS: 22.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: D

PATTERN NO.: DFS29



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

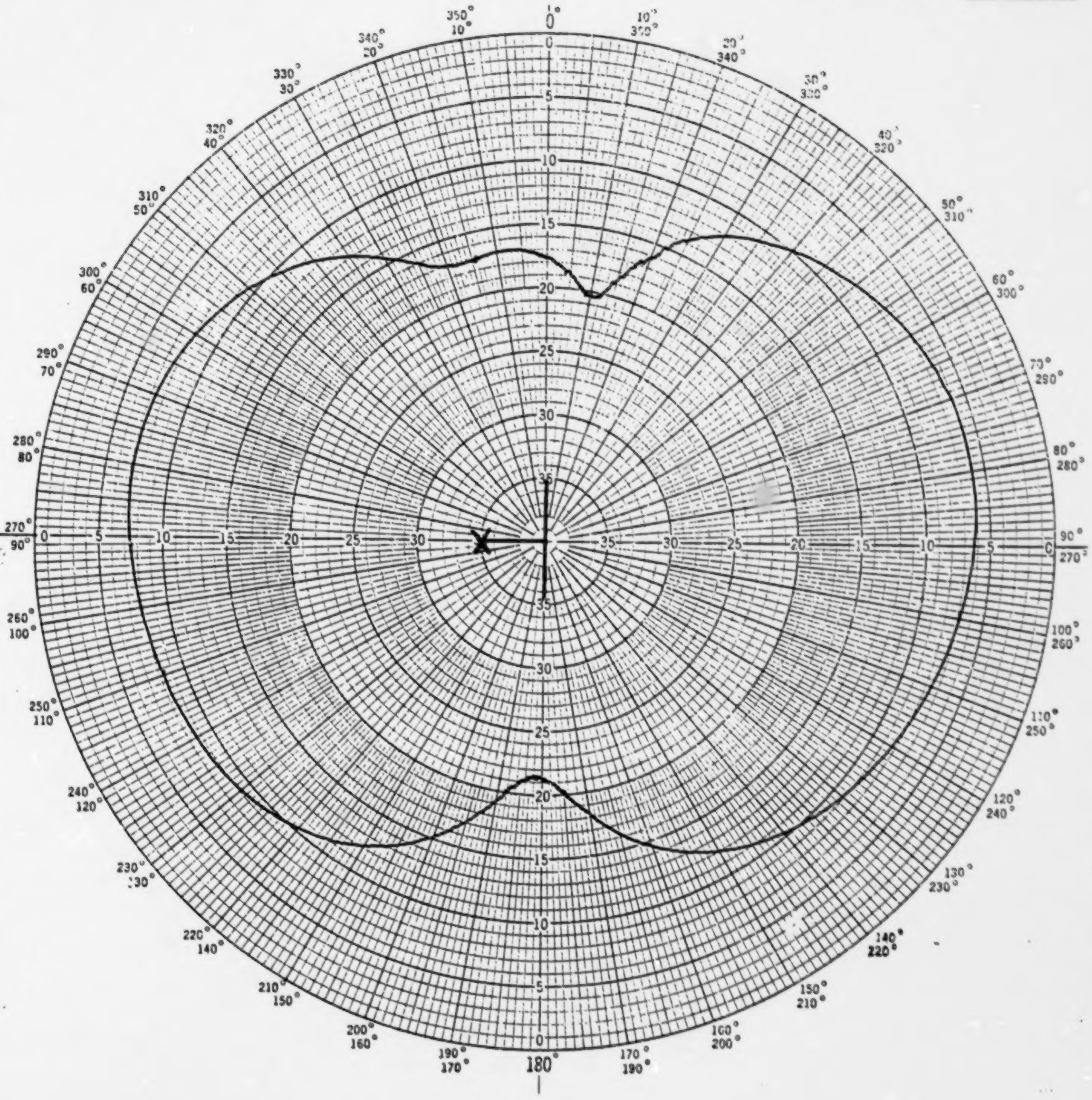
RING RADIUS: 22.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: D

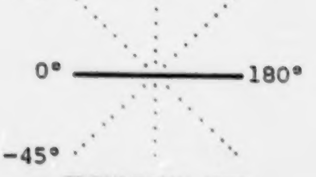
PATTERN NO.: DFS30



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

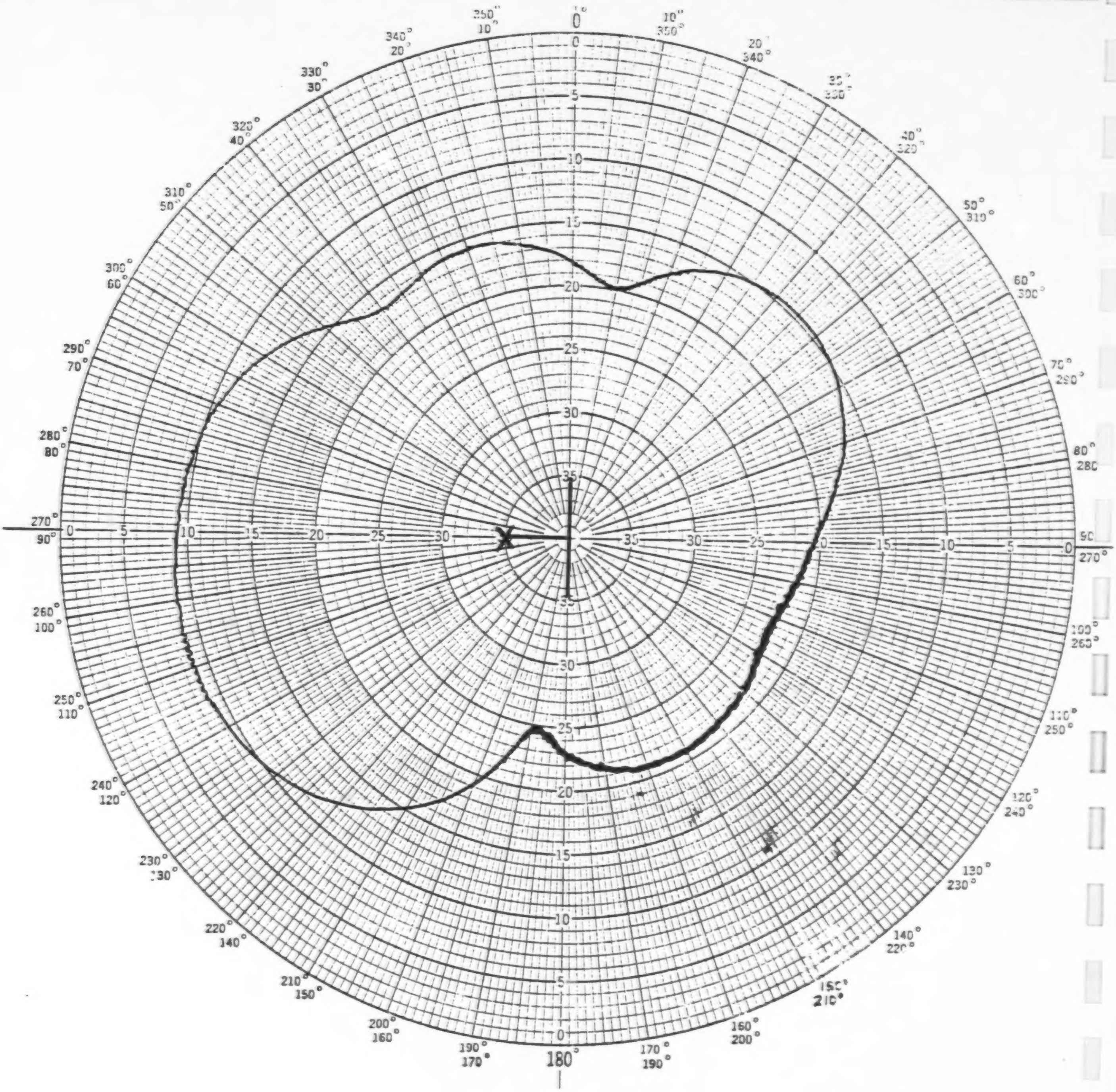
RING RADIUS: 22.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: D

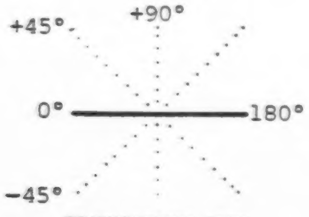
PATTERN NO.: DFS31



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

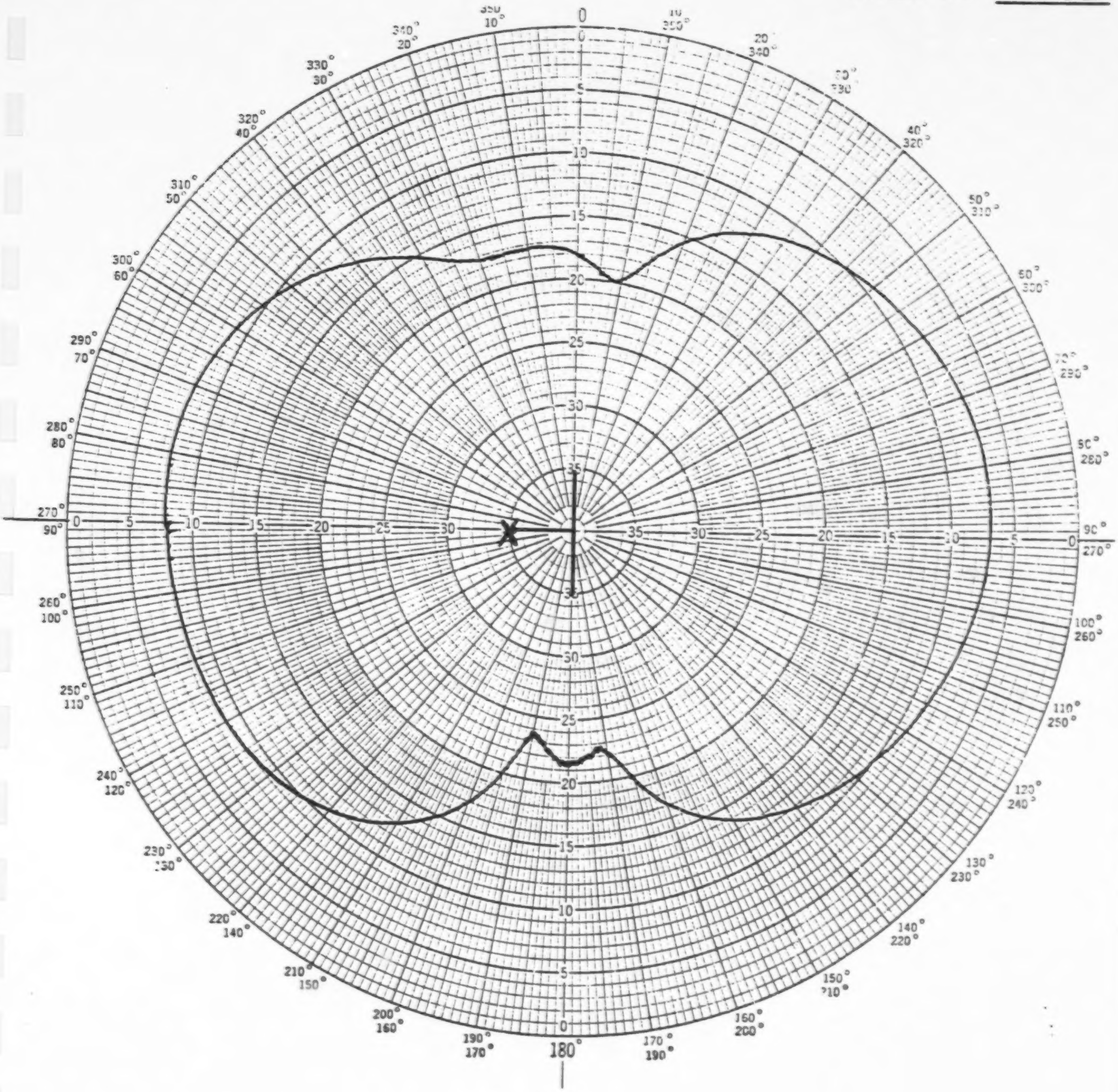
RING RADIUS: 22.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: D

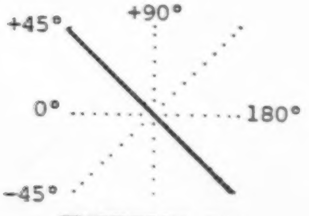
PATTERN NO.: DF532



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

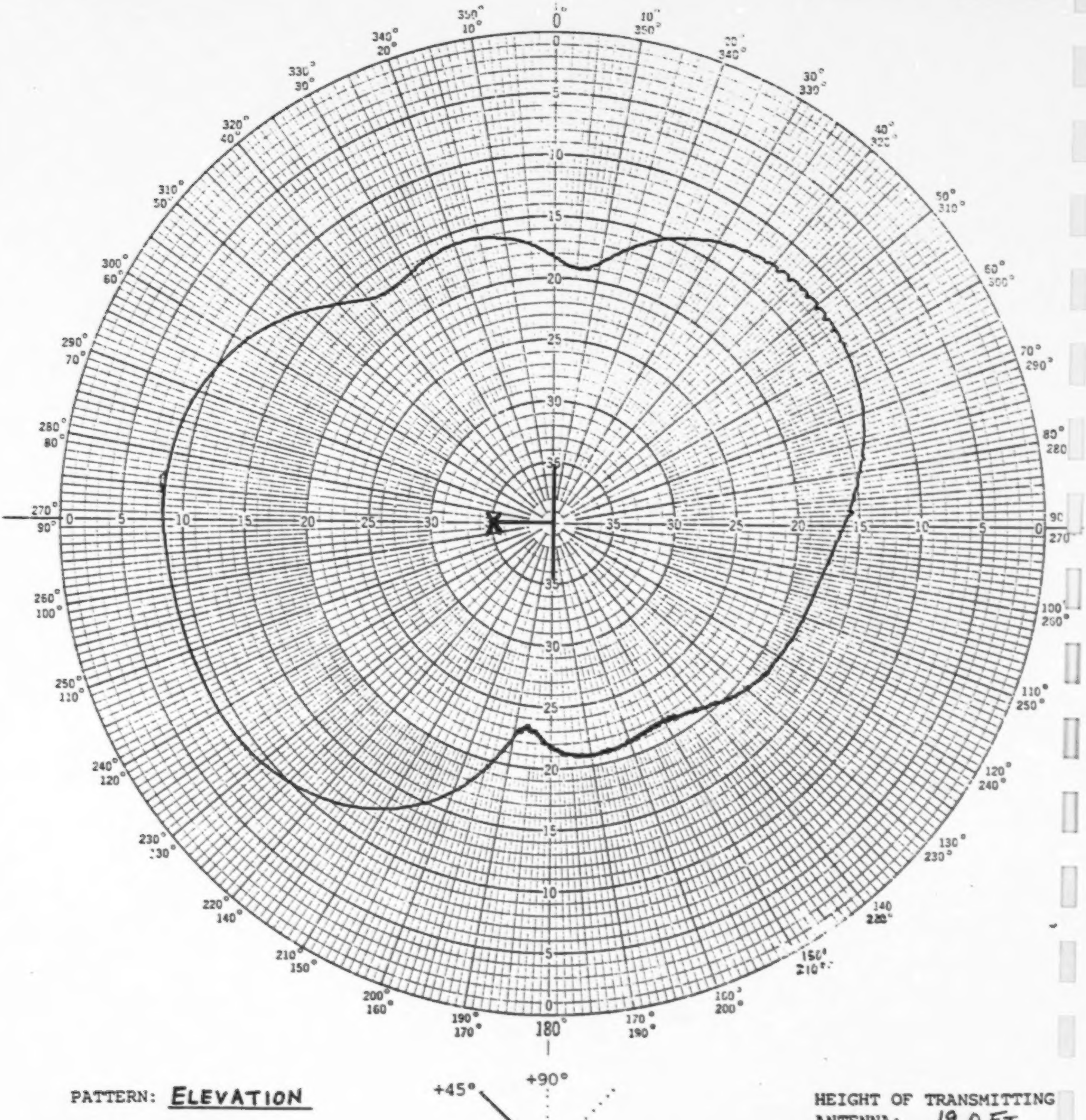
RING RADIUS: 22.5 FT.

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: D

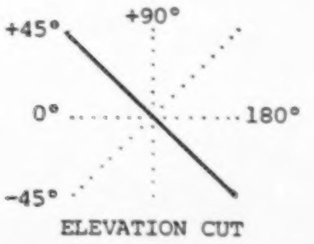
PATTERN NO.: DFS33



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

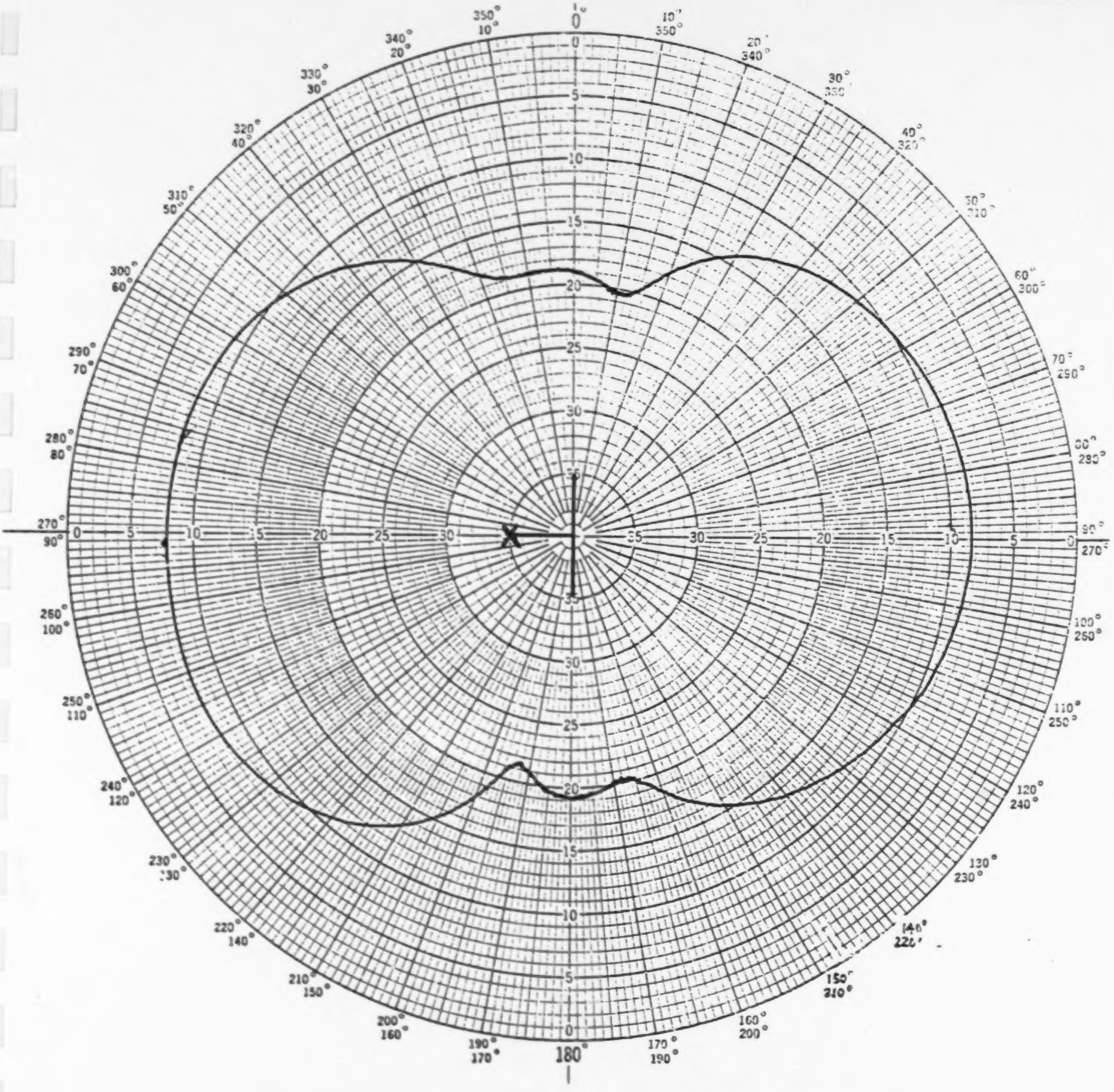
RING RADIUS: 22.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: D

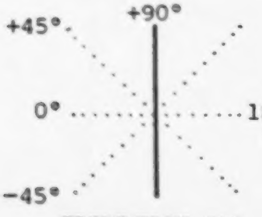
PATTERN NO.: DFS34



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

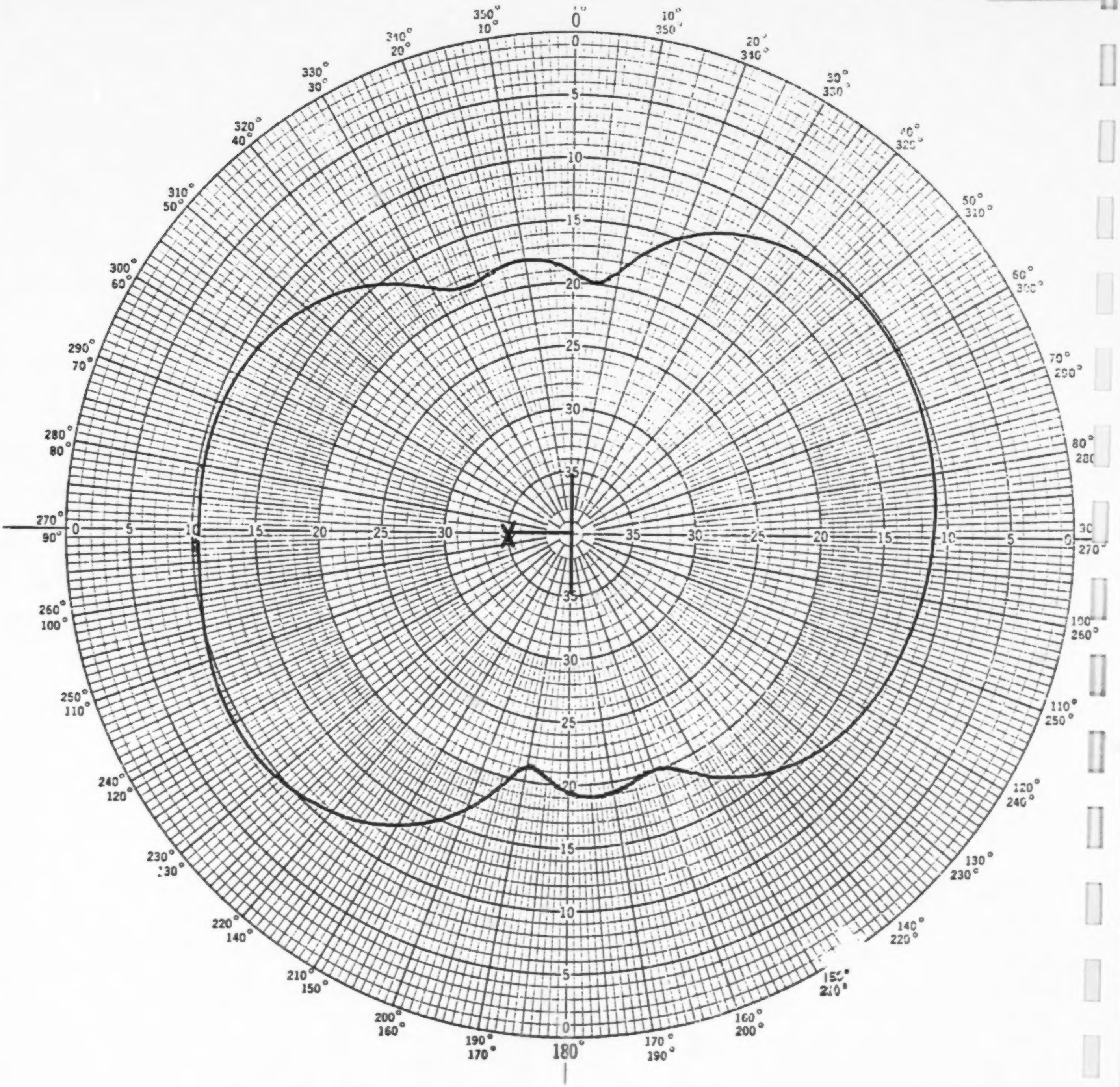
RING RADIUS: 22.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: D

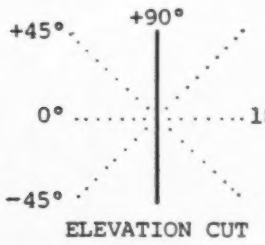
PATTERN NO.: DFS35



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

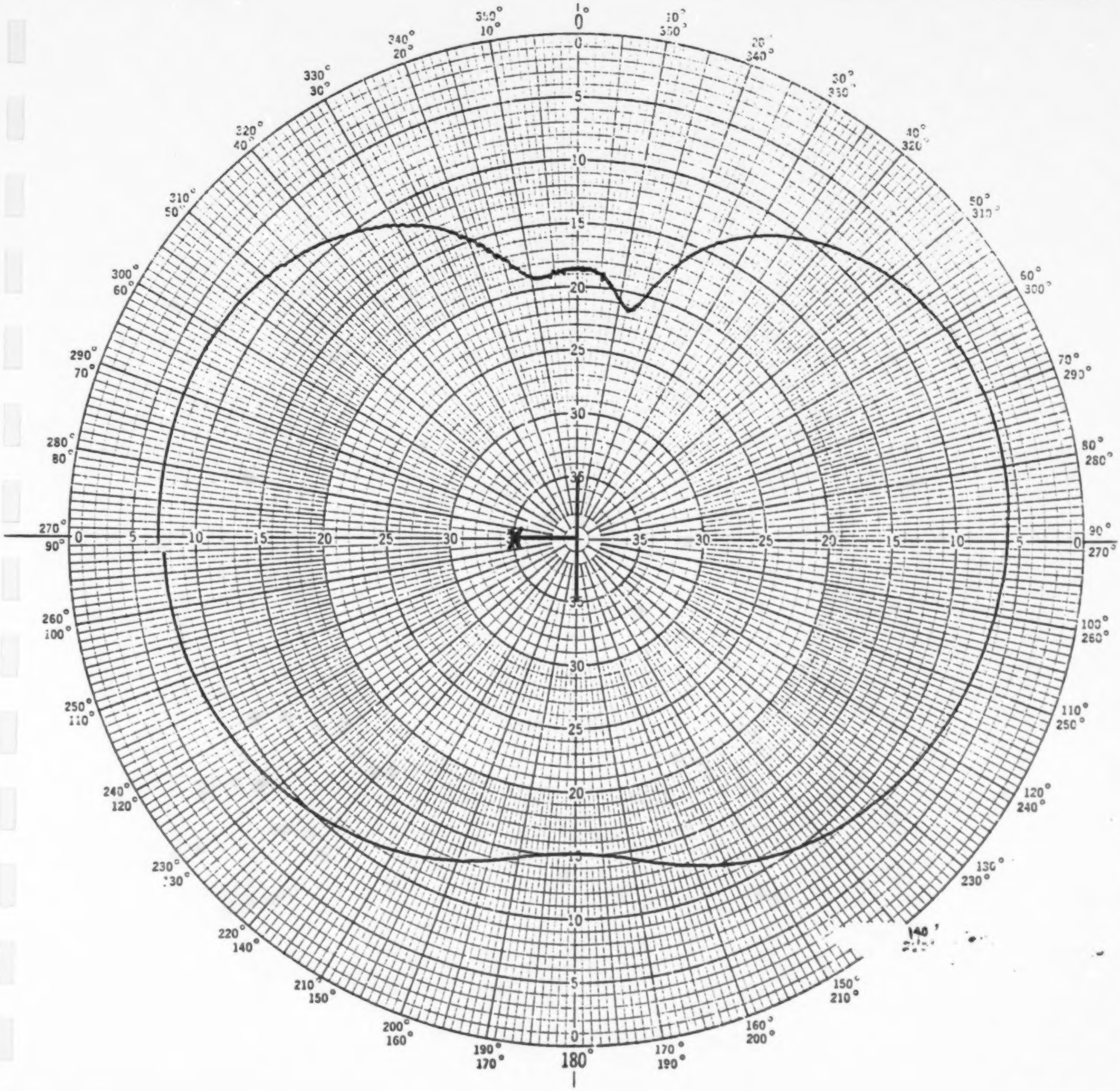
RING RADIUS: 22.5"

**Micro Communications Inc.**

DATE: 7/31/81

MODEL: D

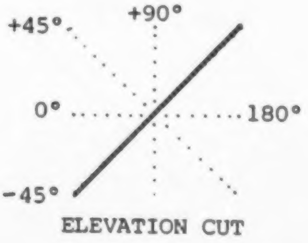
PATTERN NO.: DFS36



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

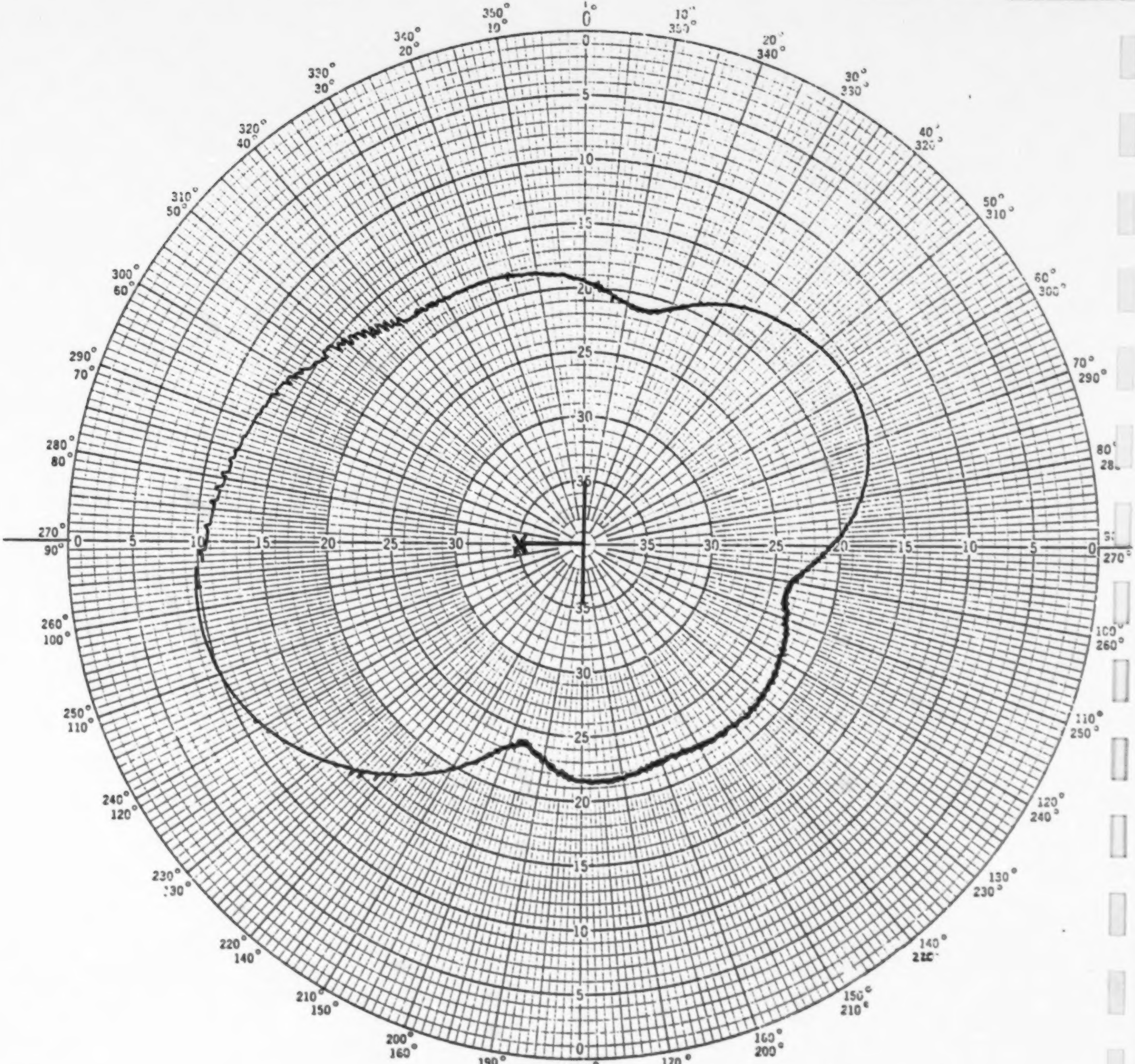
RING RADIUS: 22.5"

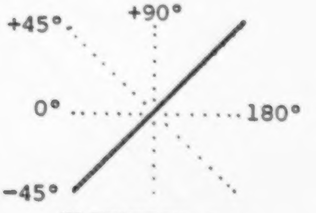
**Micro Communications Inc.**

DATE: 7/31/81

MODEL: D

PATTERN NO.: DFS37





ELEVATION CUT

PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

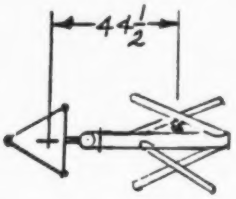
DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

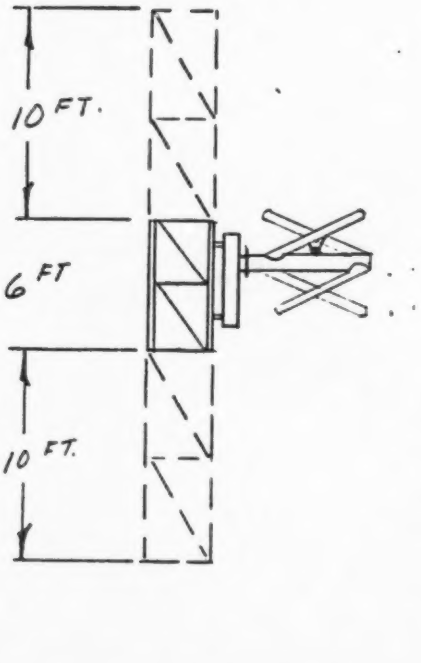
RING RADIUS: 22.5"

# MODEL "D"
# ANTENNA MOUNTED
# ON TOWER FACE
August 3, 1981

| PATTERN NUMBER | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLAR-IZATION | REMARKS |
|---|---|---|---|---|
| DF1 (166)* | 22.5 | Axial Ratio | | |
| DF2 (167) | 16.5 | Axial Ratio | | |
| DF3 (168) | 16.5 | Azimuth | Hoz. | |
| DF4 (169) | 16.5 | Azimuth | Vert. | |
| DF5 (170) | 16.5 | Elevation | Hoz. | 0-180 cut |
| DF6 (171) | 16.5 | Elevation | Vert. | 0-180 cut |
| DF7 (172) | 16.5 | Elevation | Hoz. | +45 cut |
| DF8 (173) | 16.5 | Elevation | Vert. | +45 cut |
| DF9 (174) | 16.5 | Elevation | Hoz. | +90 cut |
| DF10 (175) | 16.5 | Elevation | Vert. | +90 cut |
| DF11 (176) | 16.5 | Elevation | Hoz. | -45 cut |
| DF12 (177) | 16.5 | Elevation | Vert. | -45 cut |

*Page Numbers



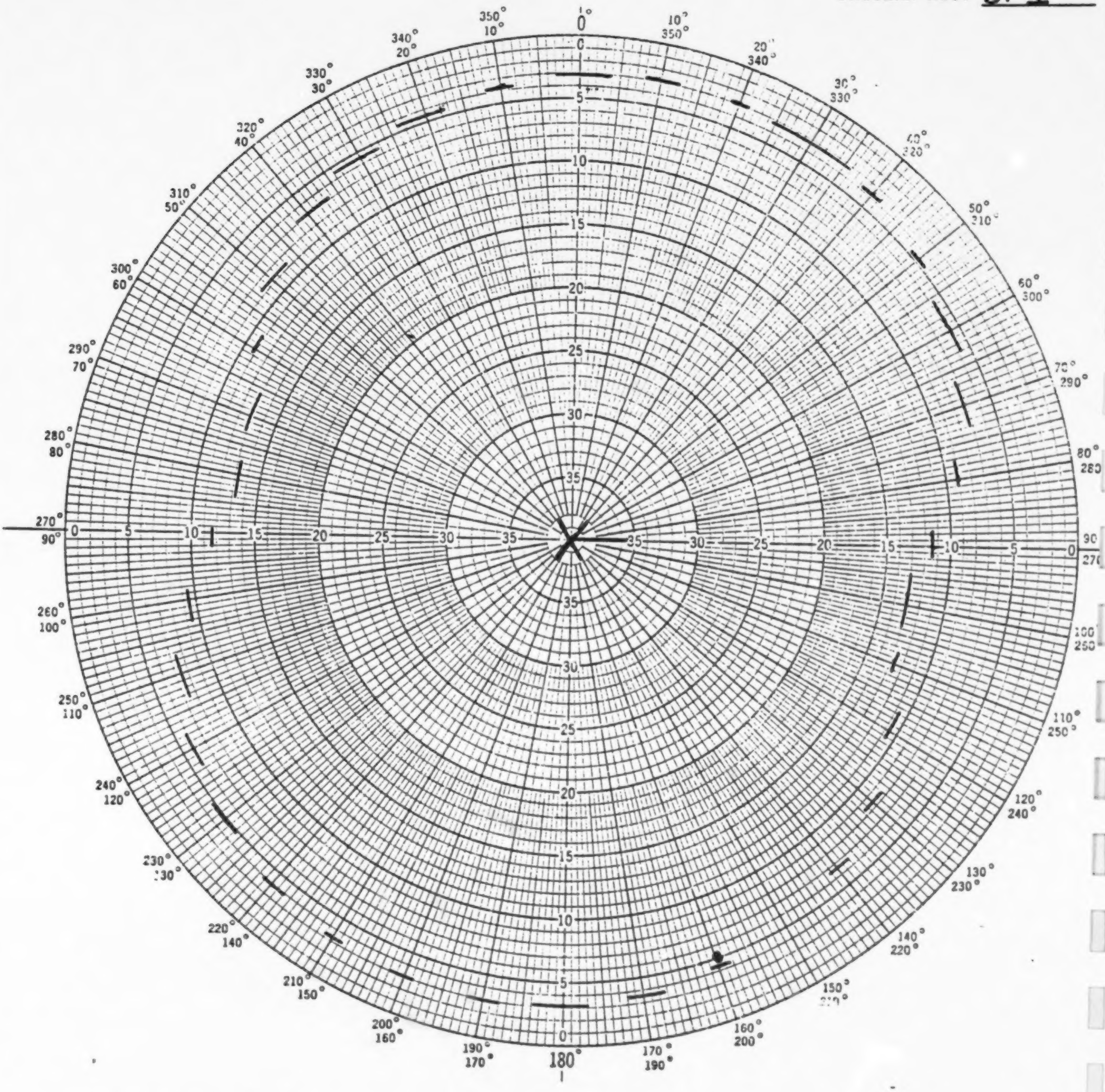


**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

PATTERN NO.: DF1



PATTERN: Axial Ratio

ANTENNA LOCATION ON TOWER: Face

TRANSMITTING ANTENNA POLARIZATION: ______

HEIGHT OF TRANSMITTING ANTENNA: 22.5 Ft.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 Ft.

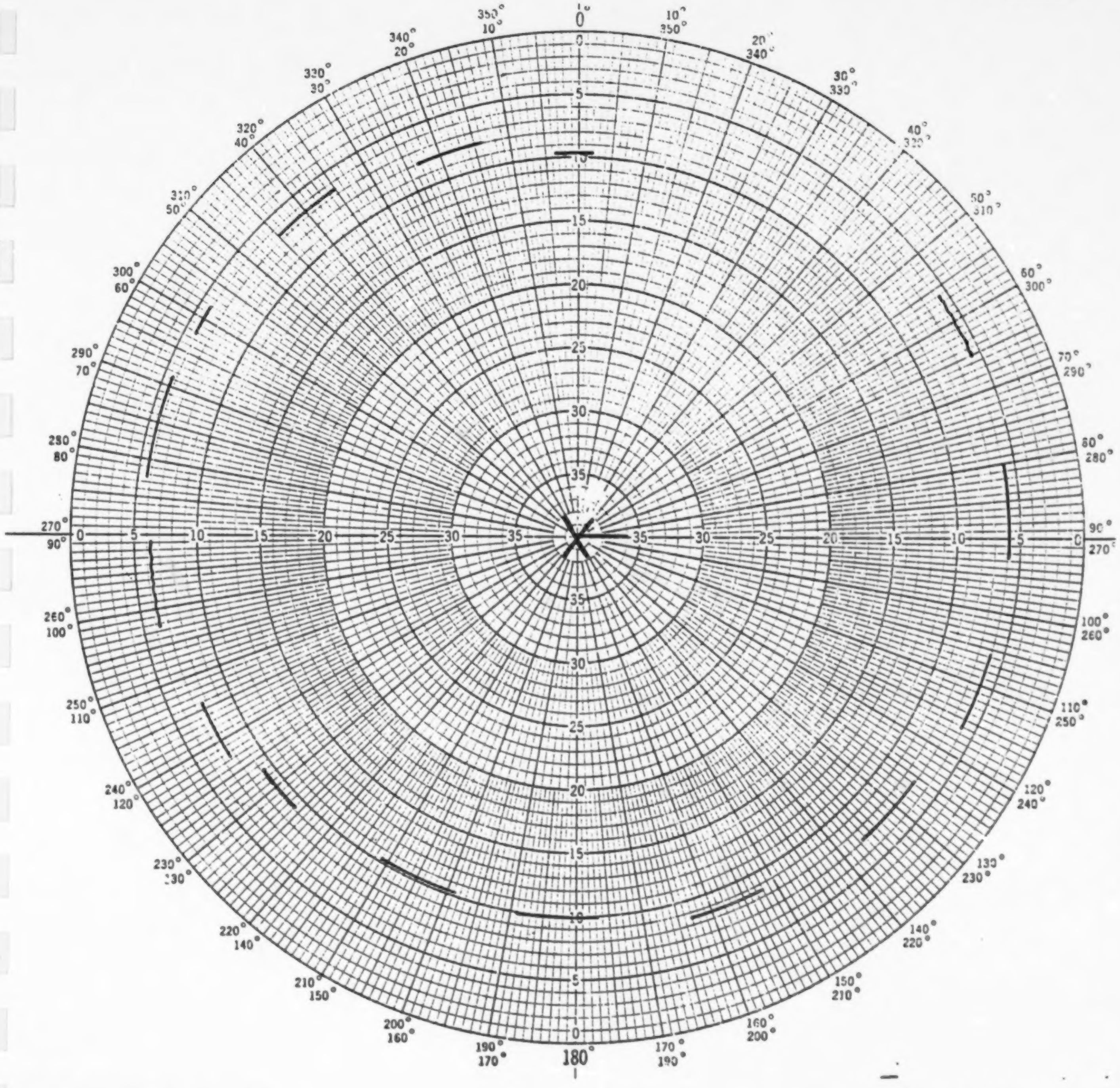
RING RADIUS: 44.5"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

PATTERN NO.: DF2



PATTERN: AXIAL RATIO

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: ______

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

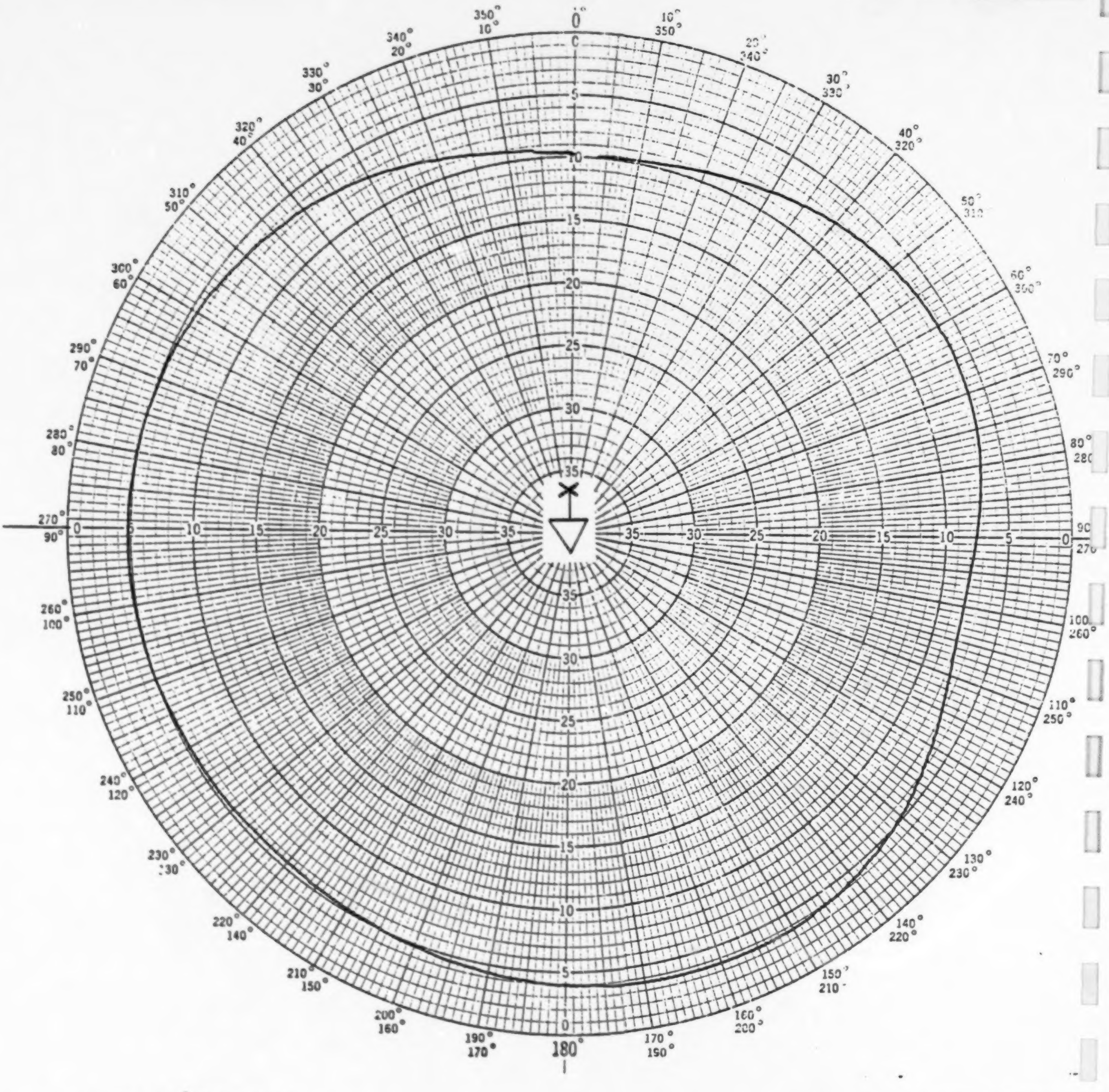
RING RADIUS: 44.5"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

PATTERN NO.: DF3



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

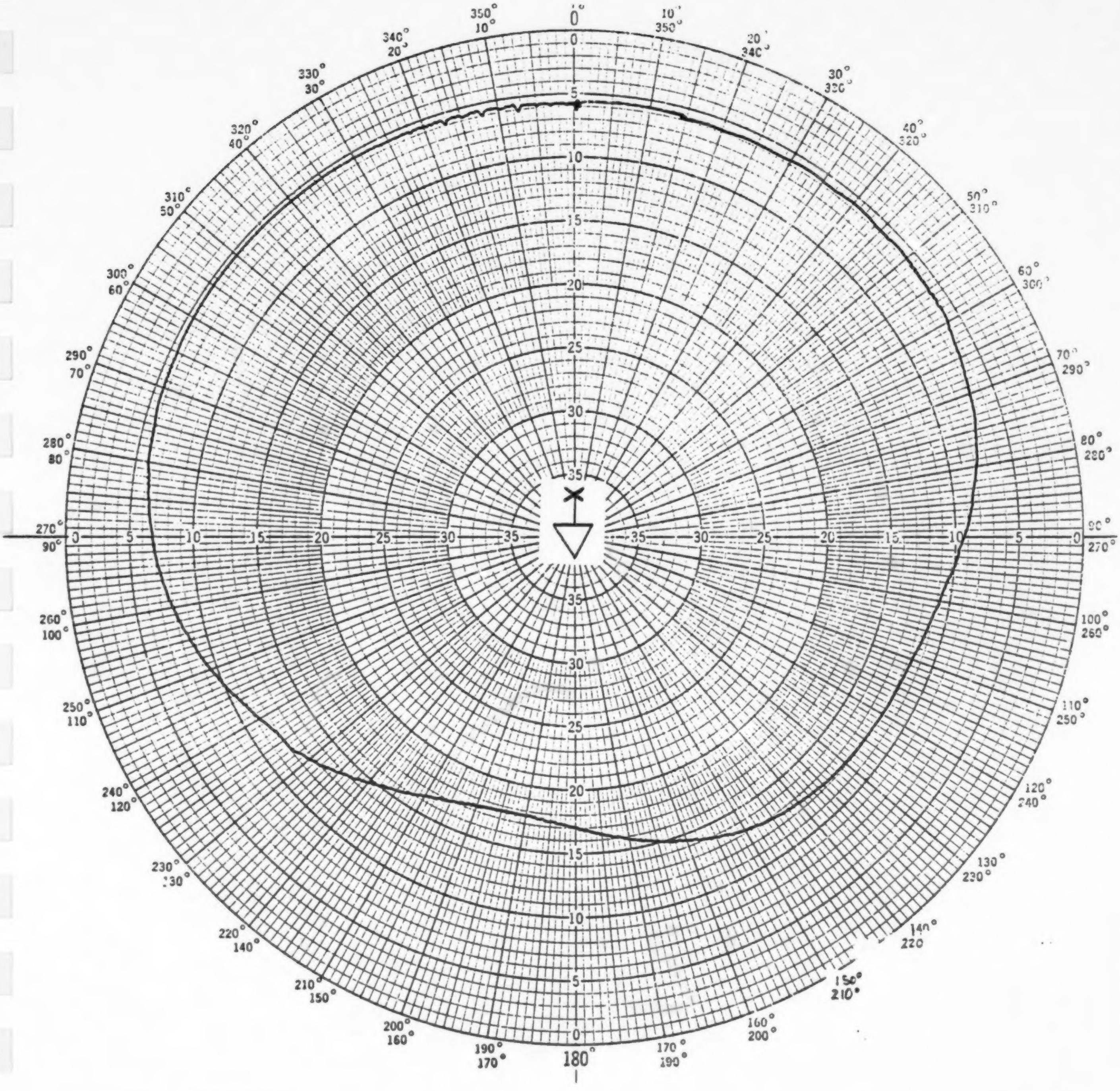
RING RADIUS: 44.5"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

PATTERN NO.: DF4



PATTERN: AZIMUTH

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: VERT.

HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

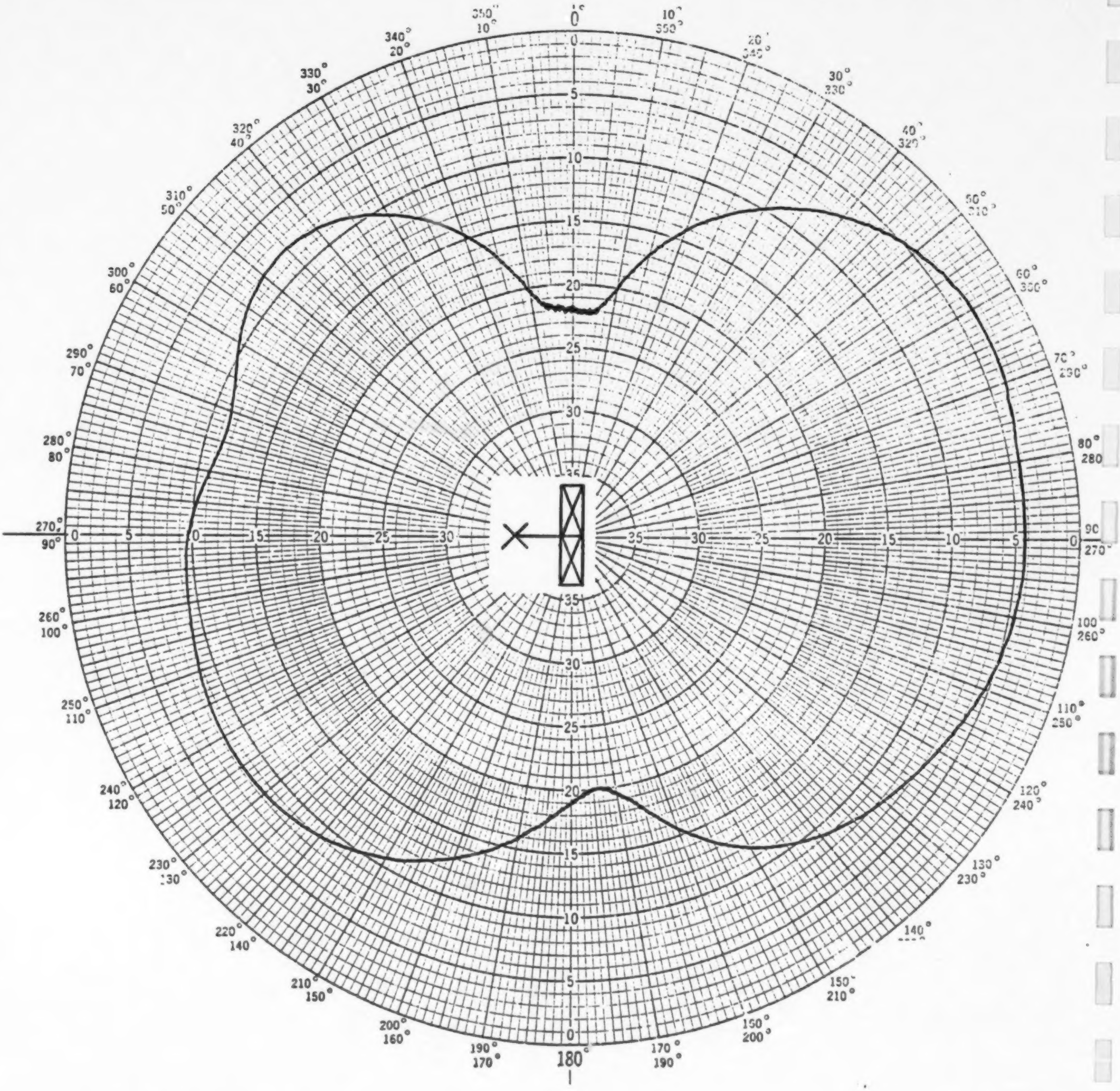
RING RADIUS: 44.5"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

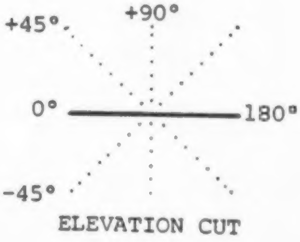
PATTERN NO.: DF5



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

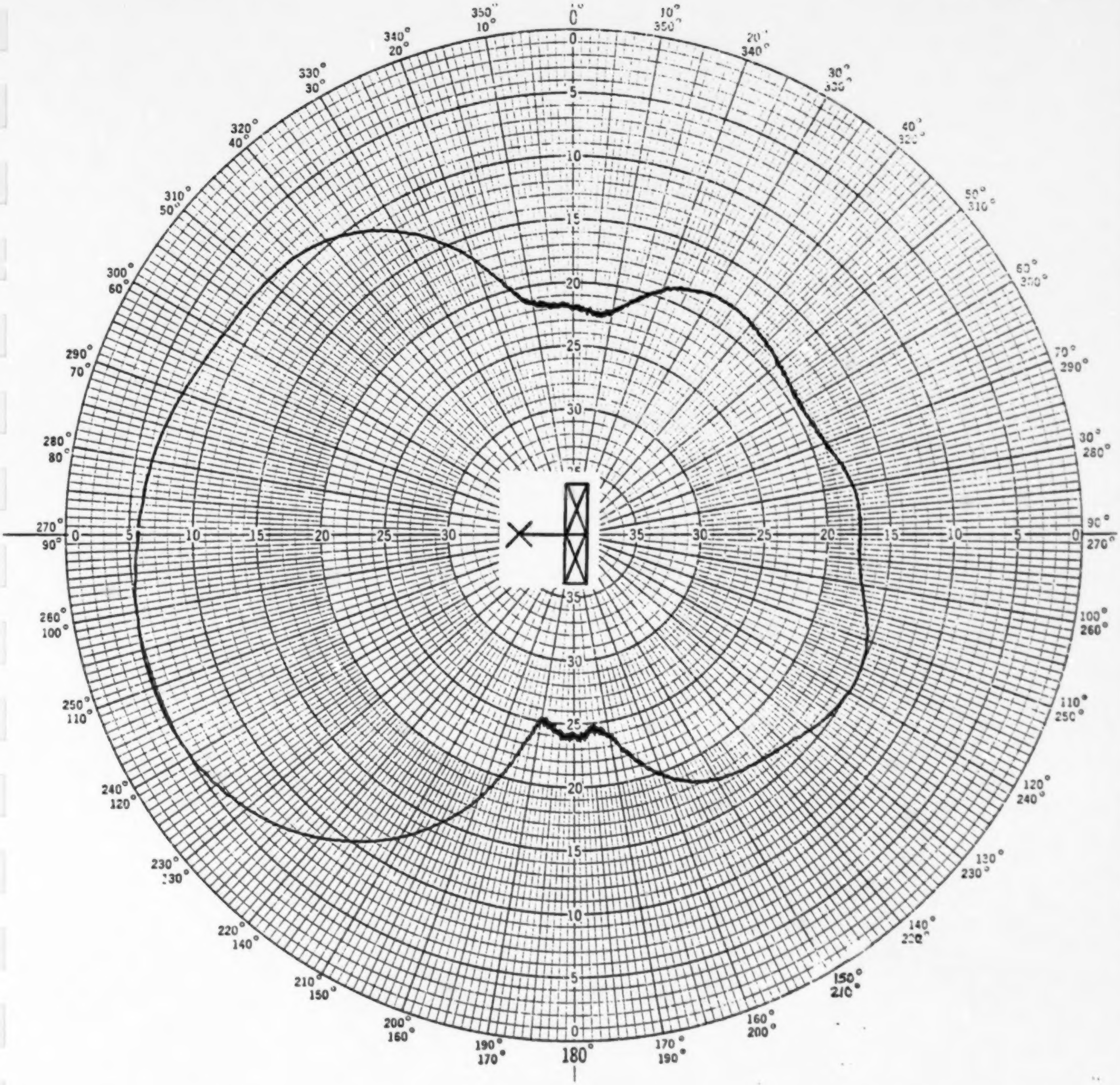
RING RADIUS: 44.5"

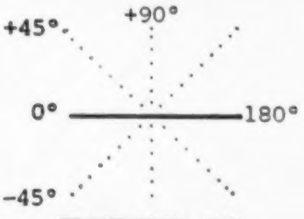
Micro Communications Inc.

DATE: 8/3/81

MODEL: D

PATTERN NO.: DF6





ELEVATION CUT

PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: VERT.

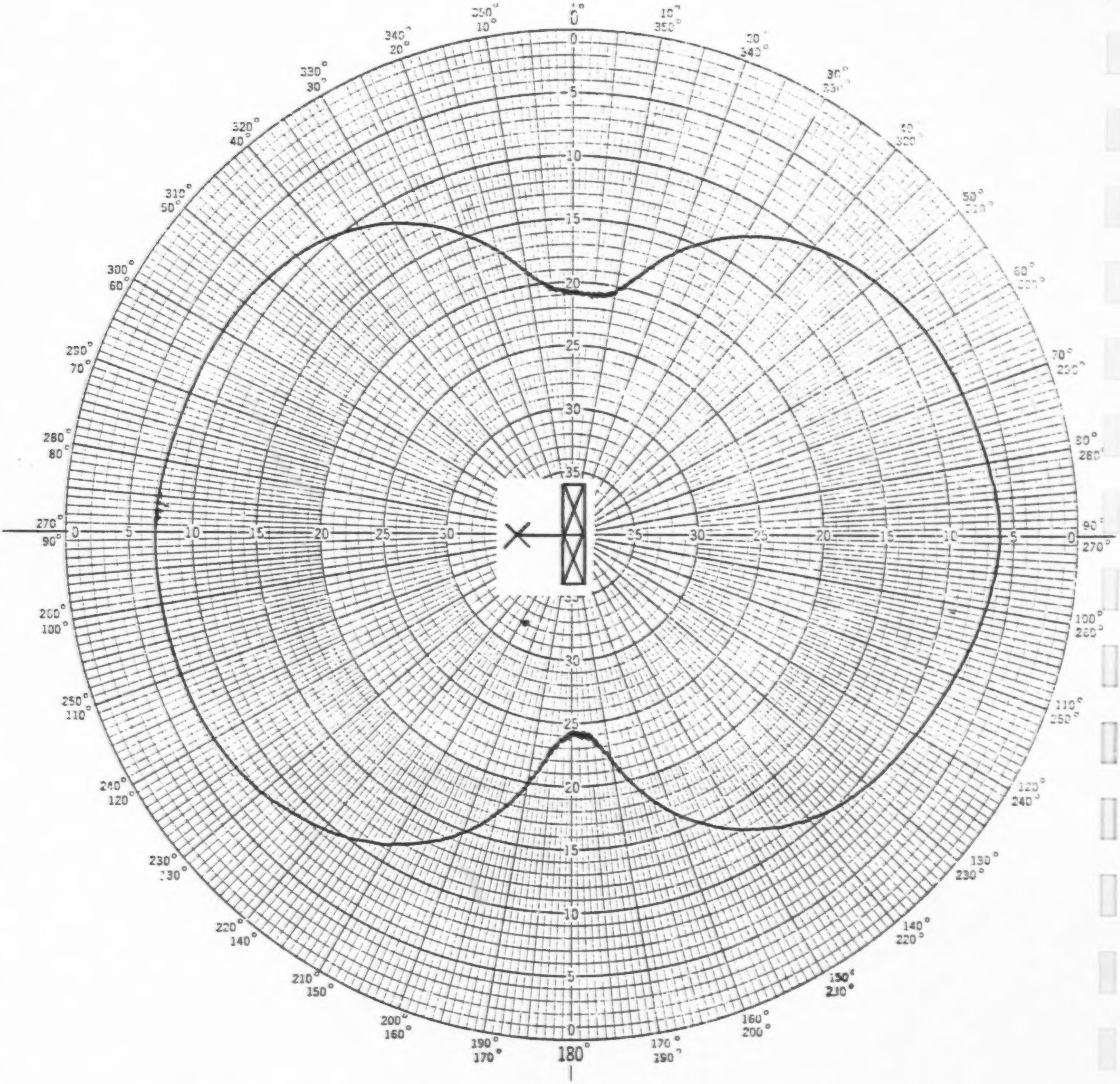
HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

RING RADIUS: 44.5"

**Micro Communications Inc.**

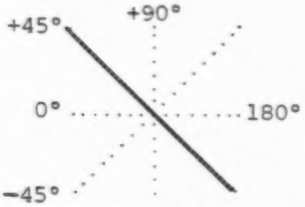
DATE: 8/3/81
MODEL: D
PATTERN NO.: DF7



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

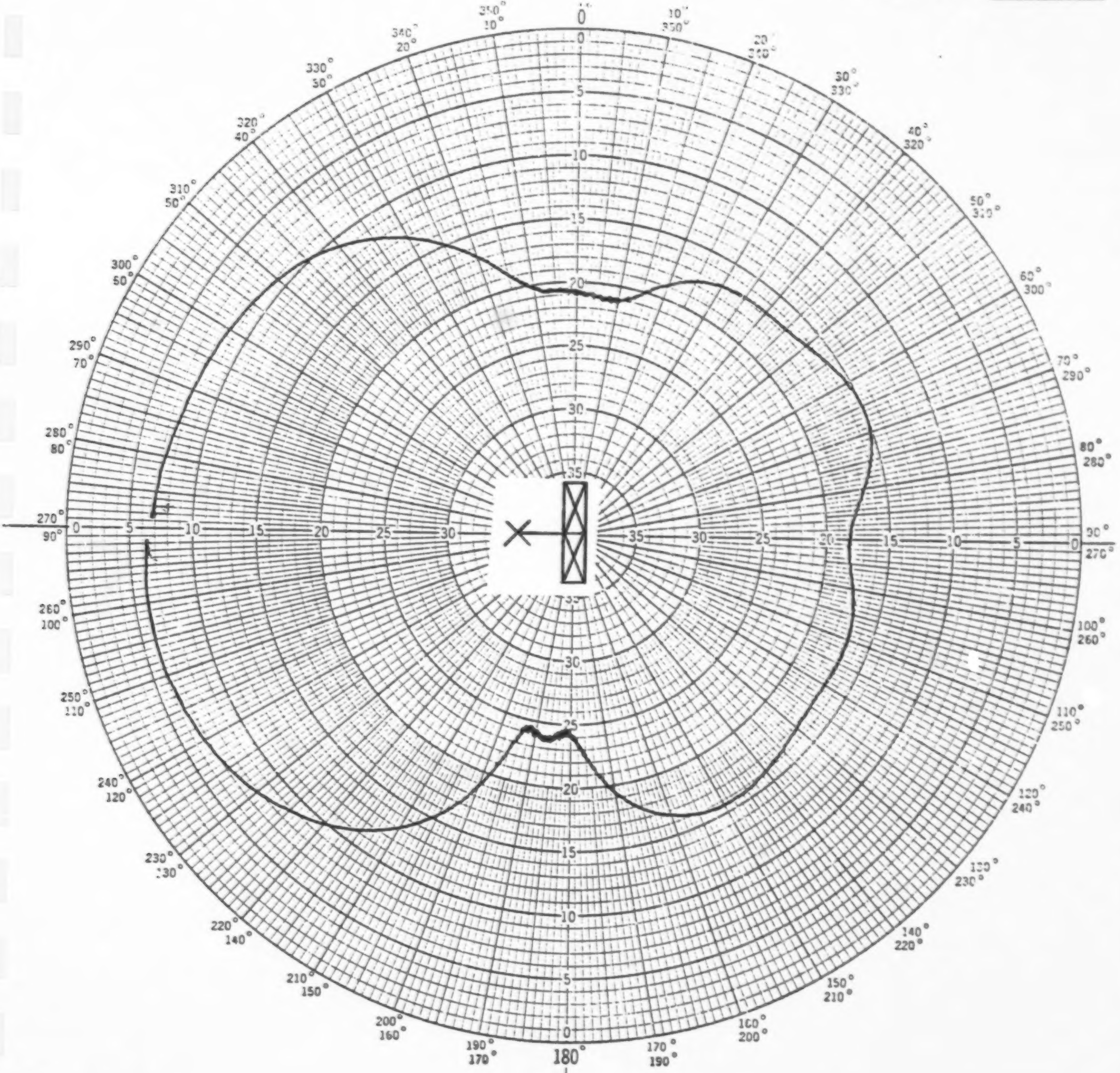
HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 44.5"

**Micro Communications Inc.**

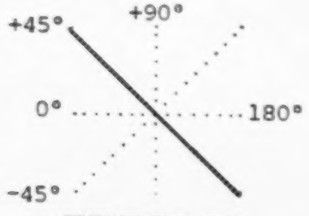
DATE: 8/3/81
MODEL: D
PATTERN NO.: DF8



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

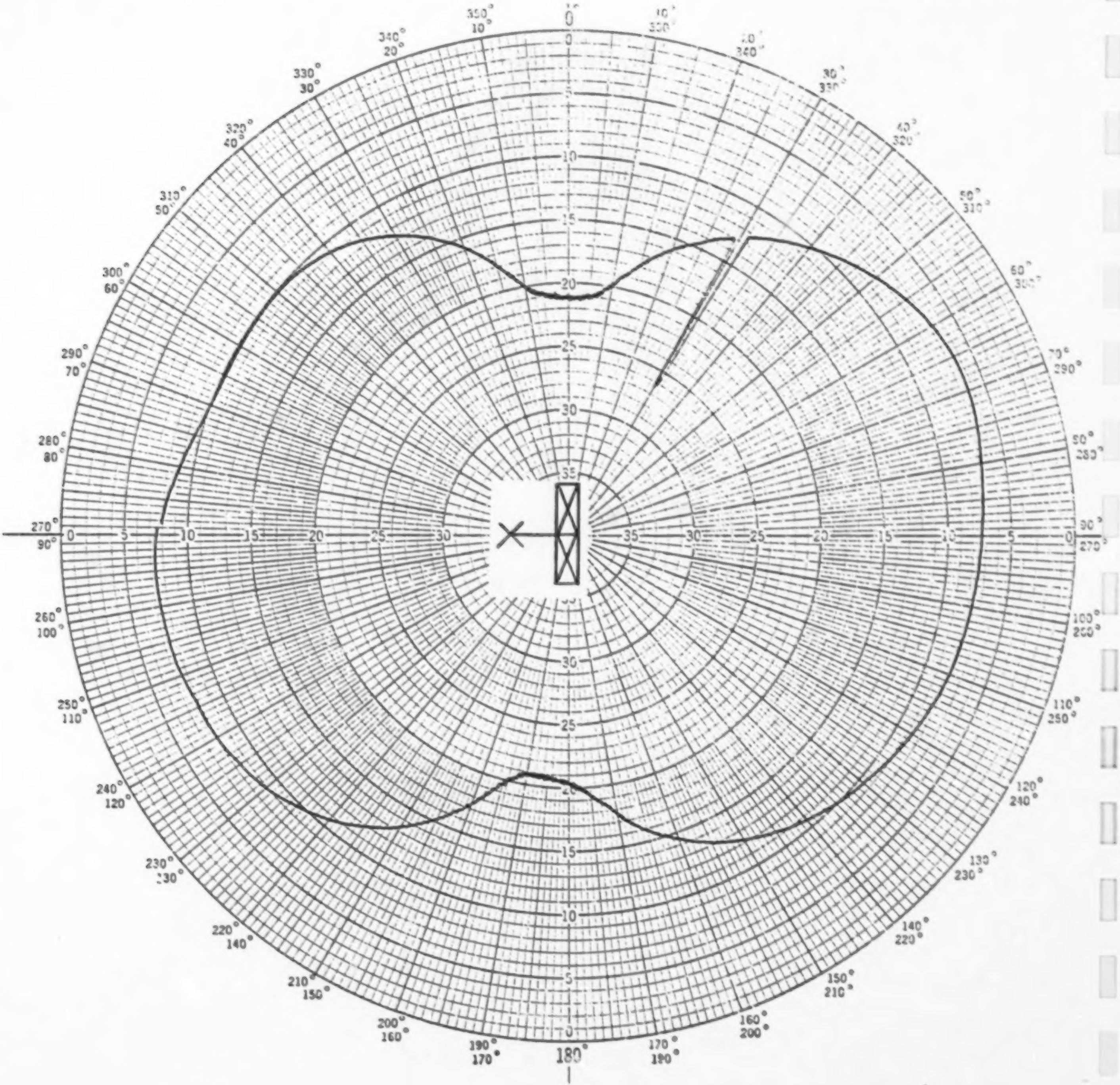
RING RADIUS: 44.5"

Micro
Communications
Inc.

DATE: 8/3/81

MODEL: D

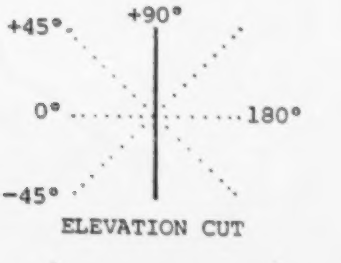
PATTERN NO.: DF9



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

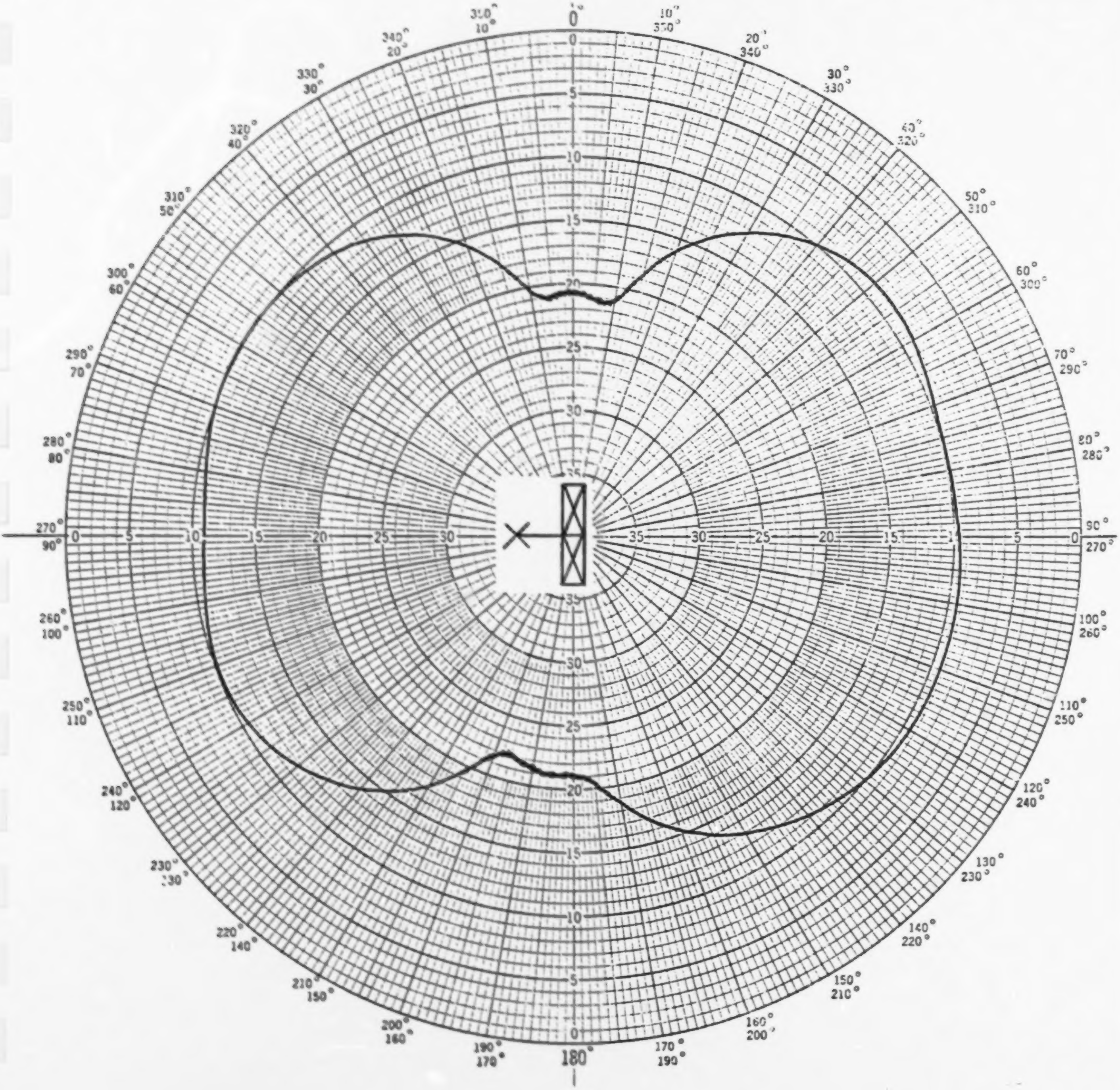
RING RADIUS: 44.5"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

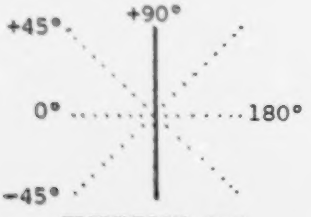
PATTERN NO.: DF10



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

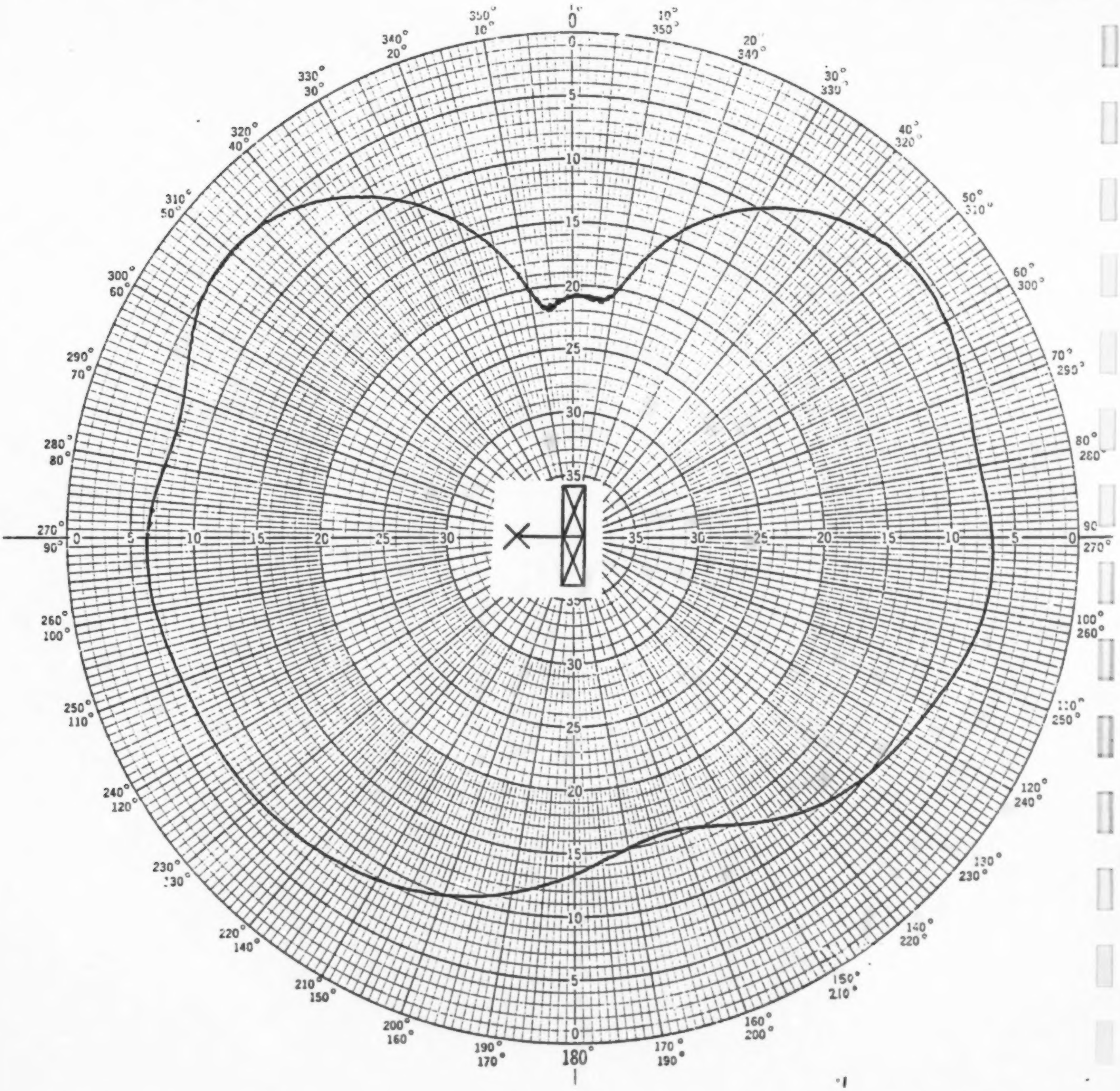
HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

RING RADIUS: 44.5"

**Micro Communications Inc.**

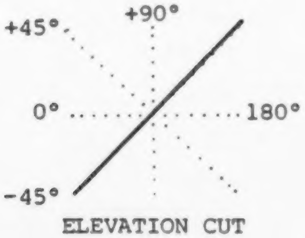
DATE: 8/3/81
MODEL: D
PATTERN NO.: DF11



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 16.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

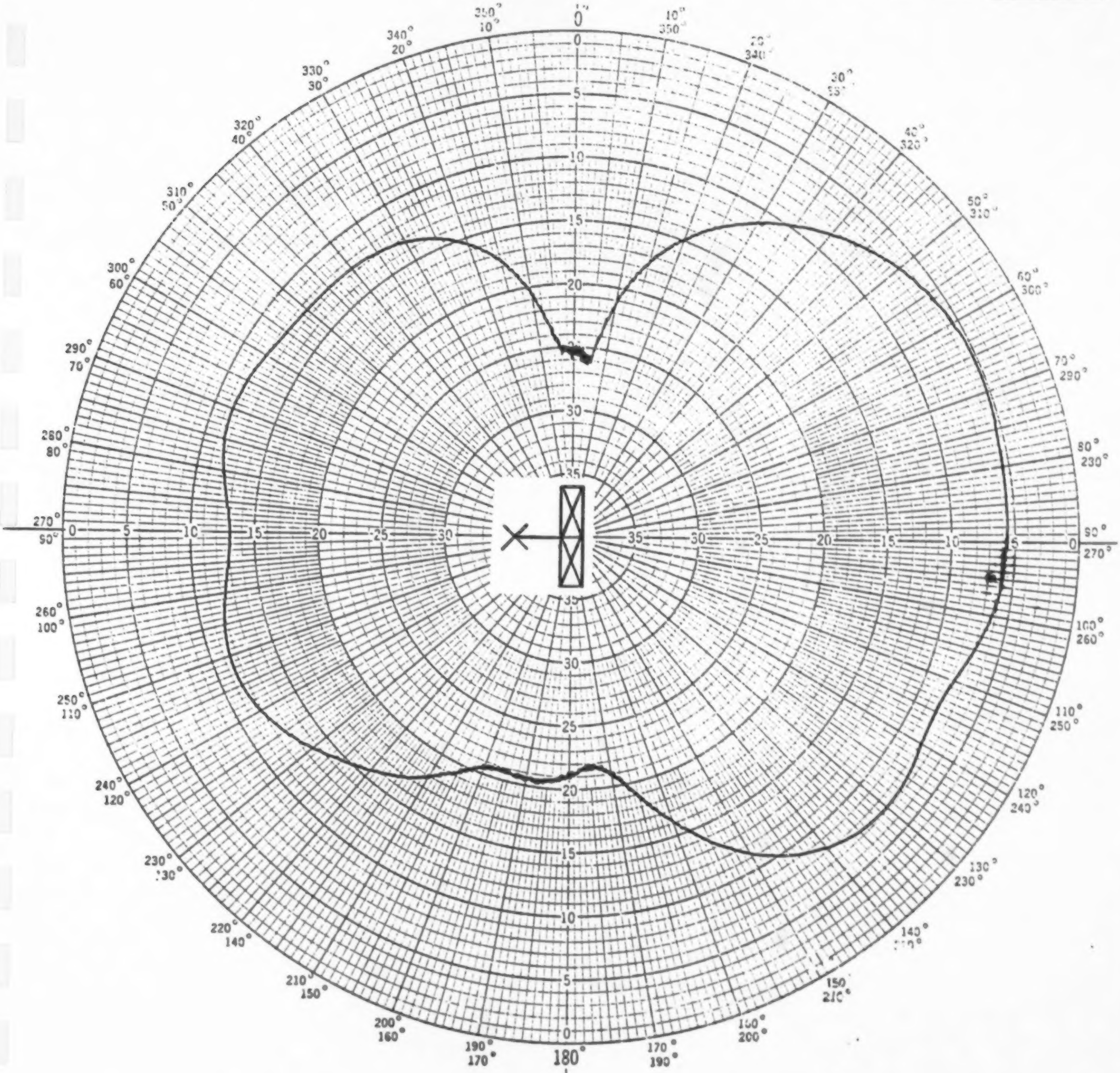
RING RADIUS: 44.5"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

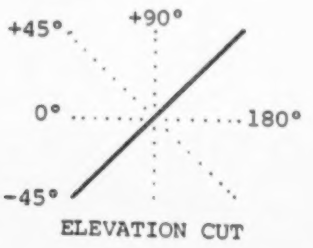
PATTERN NO.: DF12



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 16.5 FT.

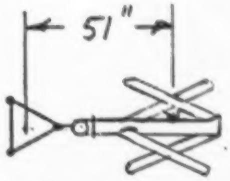
DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

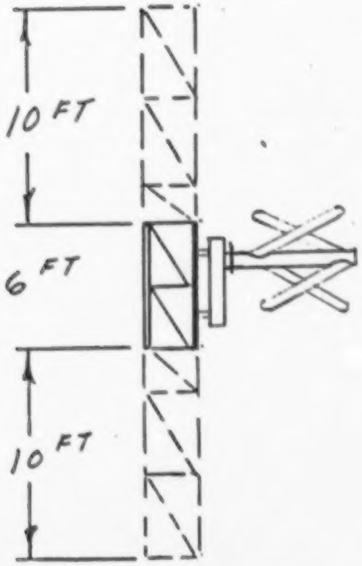
RING RADIUS: 44.5"

MODEL "D"
ANTENNA MOUNTED
ON TOWER LEG
August 3, 1981

| PATTERN NUMBER * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLAR-IZATION | REMARKS |
|---|---|---|---|---|
| DL1 (179) | 16.5 | Axial Ratio | | Tower extended to 26' |
| DL2 (180) | 22.5 | Azimuth | Hoz. | |
| DL3 (181) | 22.5 | Azimuth | Vert. | |
| DL4 (182) | 22.5 | Elevation | Hoz. | 0-180 cut |
| DL5 (183) | 22.5 | Elevation | Vert. | 0-180 cut |
| DL6 (184) | 22.5 | Elevation | Hoz. | +45 cut |
| DL7 (185) | 22.5 | Elevation | Vert. | +45 cut |
| DL8 (186) | 22.5 | Elevation | Hoz. | +90 cut |
| DL9 (187) | 22.5 | Elevation | Vert. | +90 cut |
| DL10 (188) | 22.5 | Elevation | Hoz. | -45 cut |
| DL11 (189) | 22.5 | Elevation | Vert. | -45 cut |
| DL12 (190) | 25.0 | Elevation | Hoz. | 0-180, tower extended to 26' |
| DL13 (191) | 25.0 | Elevation | Vert. | 0-180, tower extended to 26' |

*Page Numbers



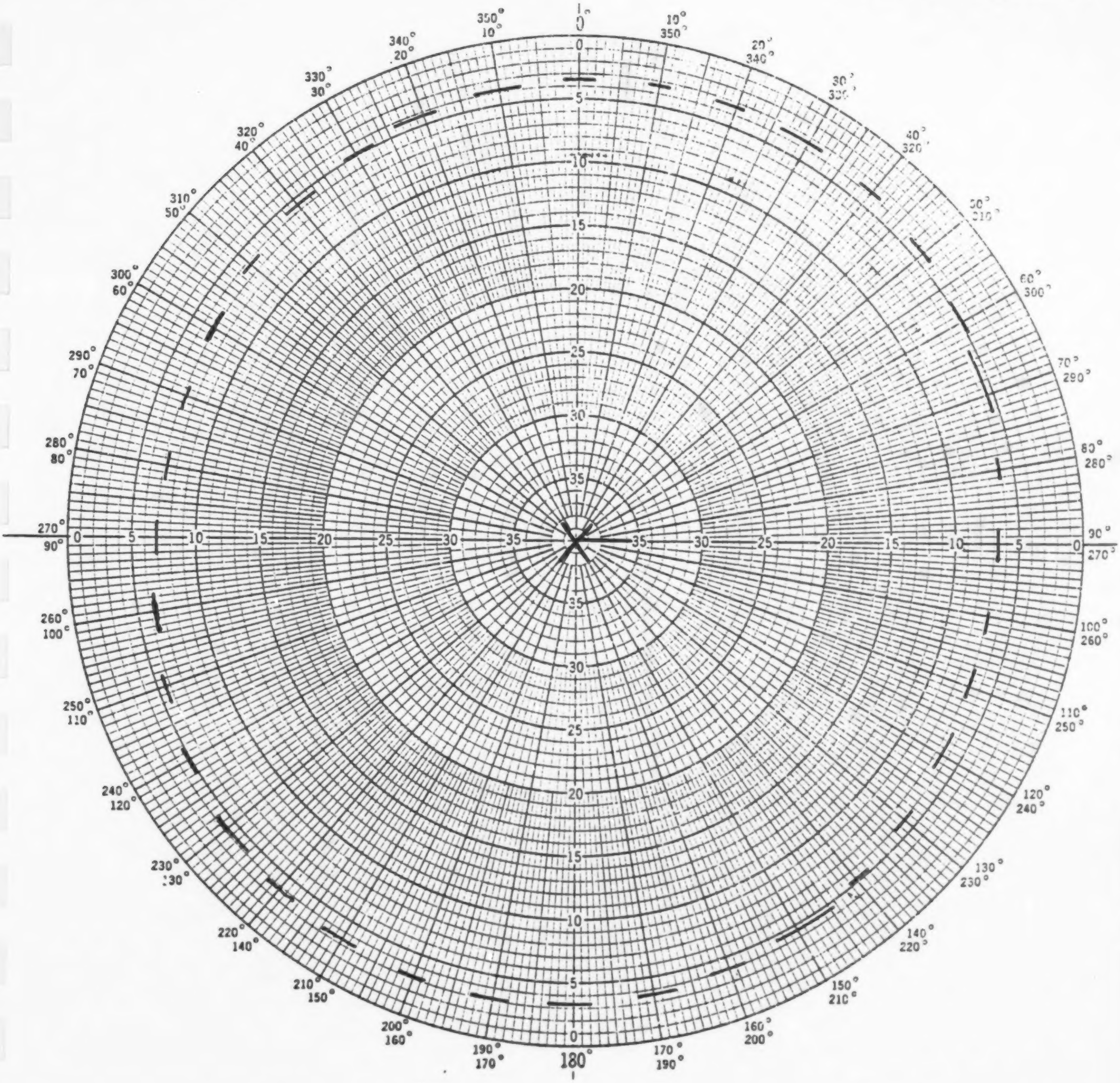


**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

PATTERN NO.: DL1



PATTERN: AXIAL RATIO

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: ______

HEIGHT OF TRANSMITTING ANTENNA: 16.5

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

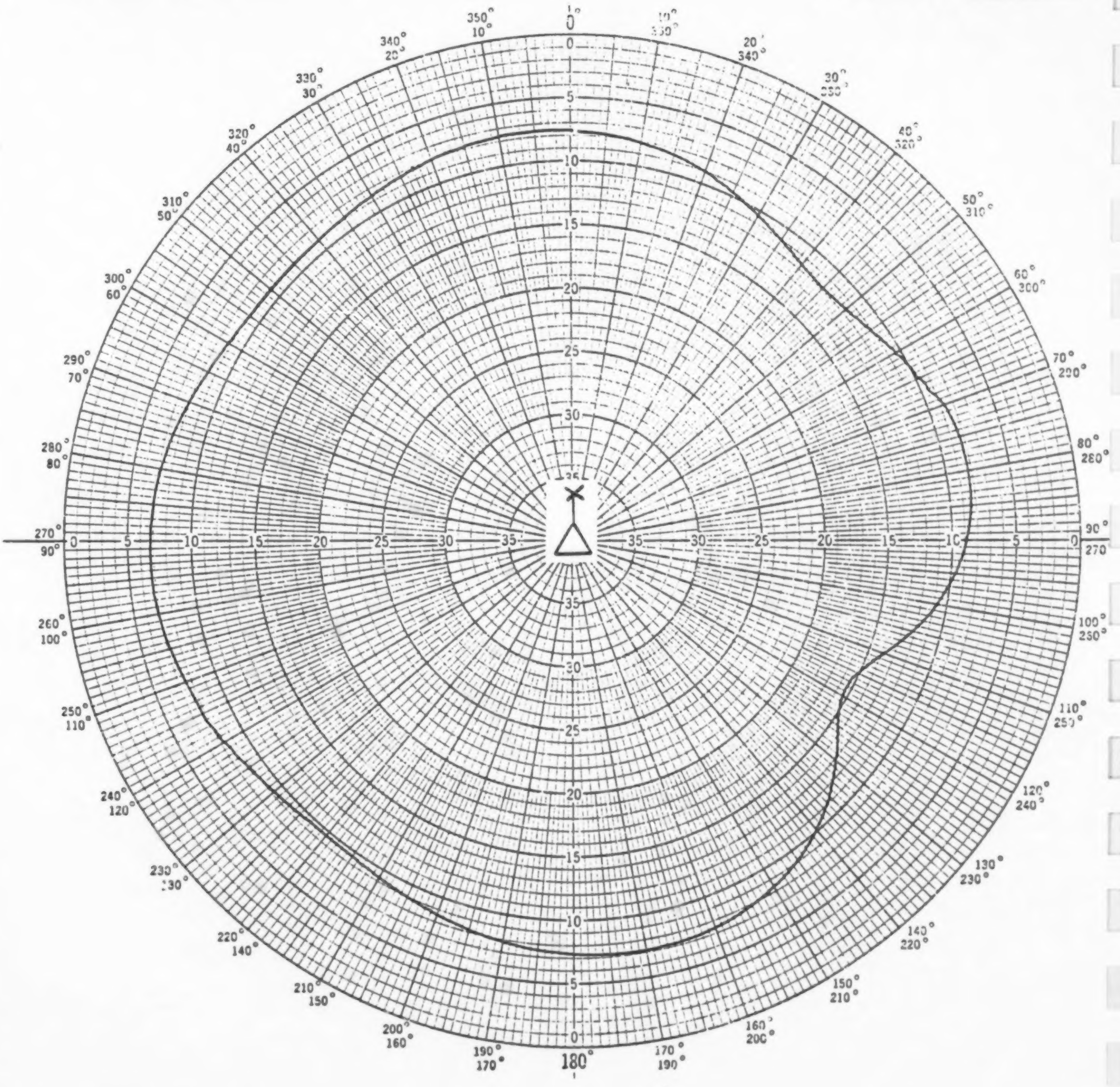
RING RADIUS: 51"

Micro
Communications
Inc.

DATE: 8/3/81

MODEL: D

PATTERN NO.: DL2



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 22.5

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

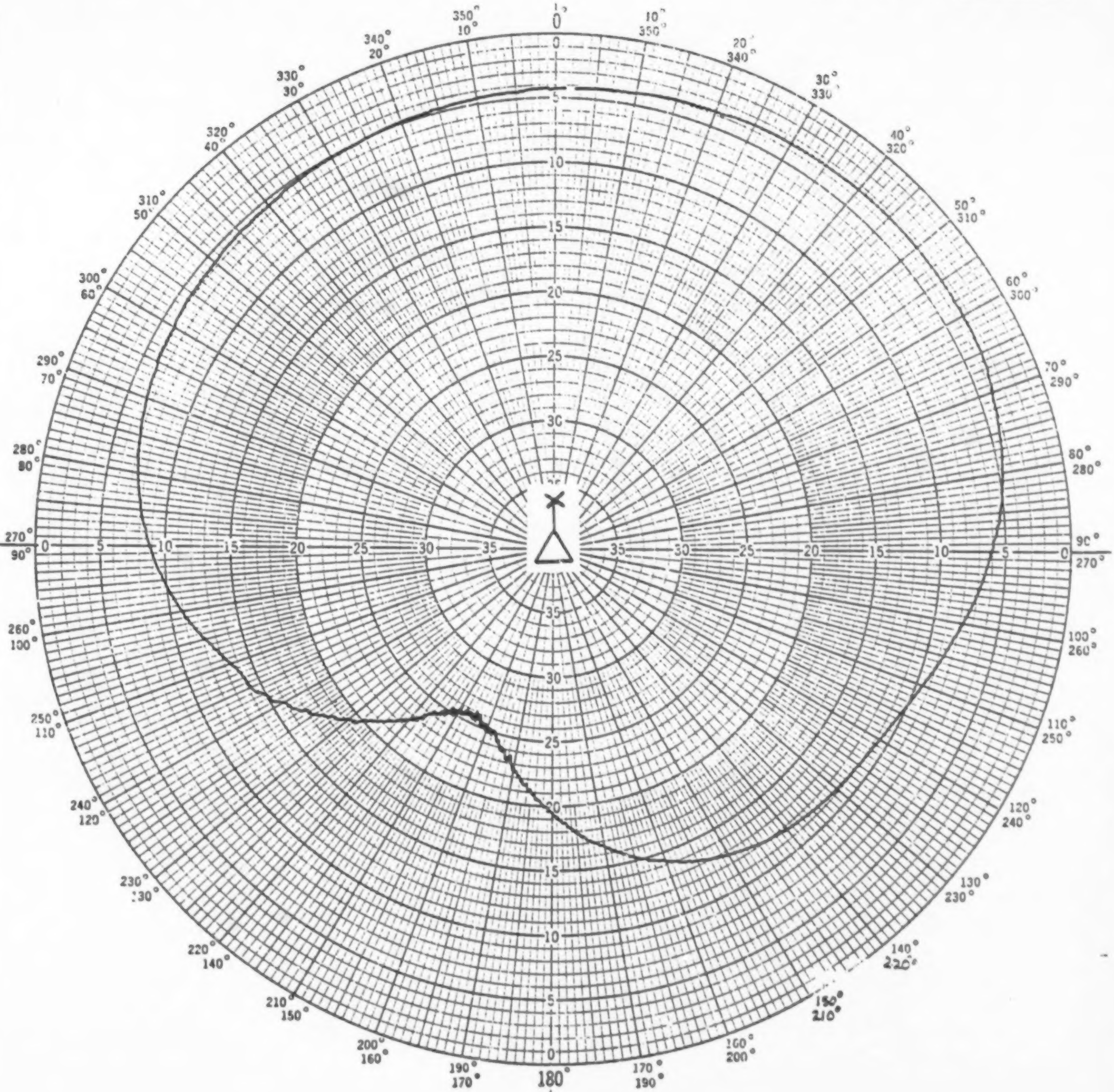
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

PATTERN NO.: DL3



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 22.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

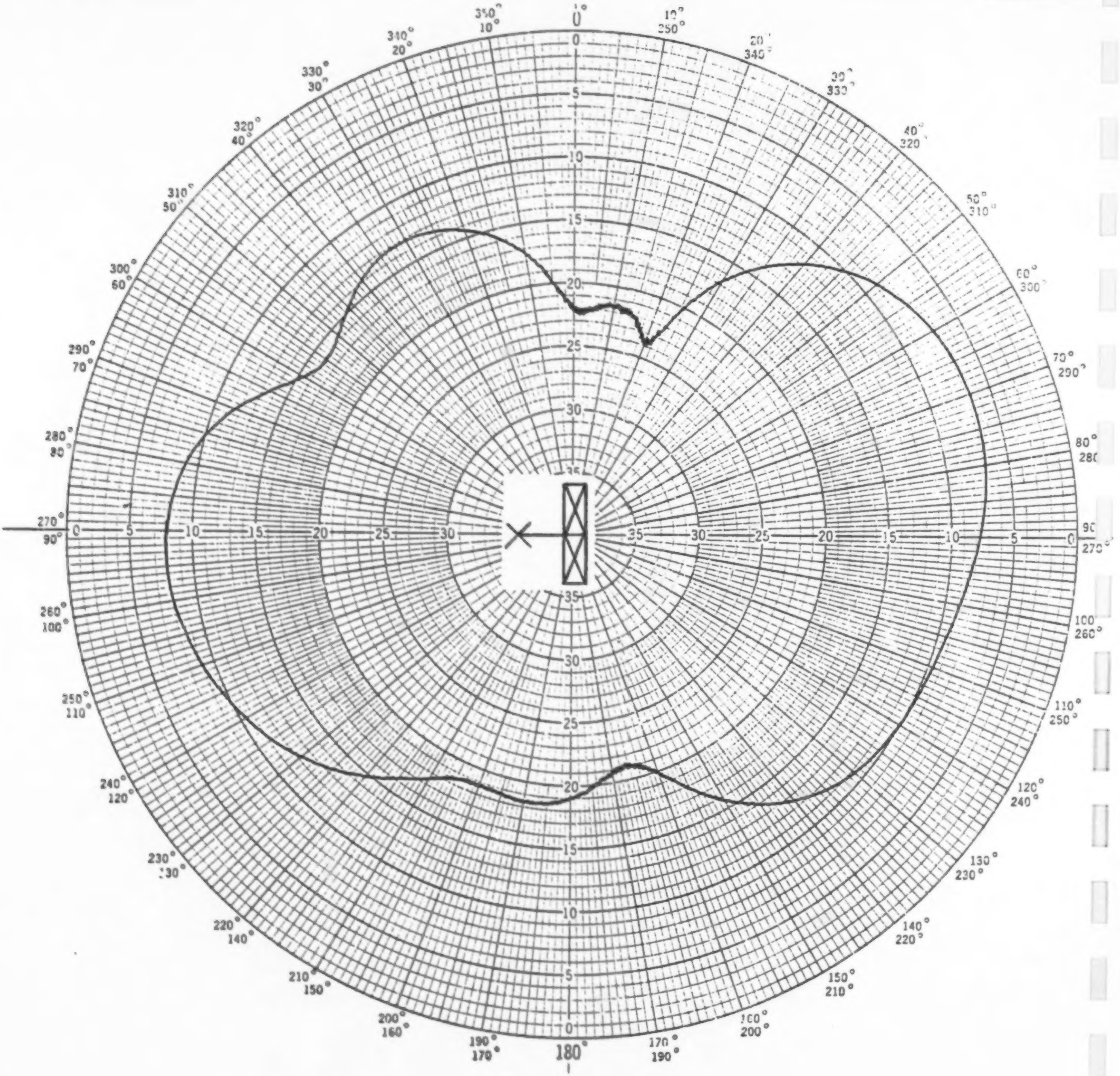
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

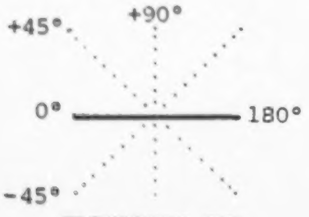
PATTERN NO.: DL4



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 22.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

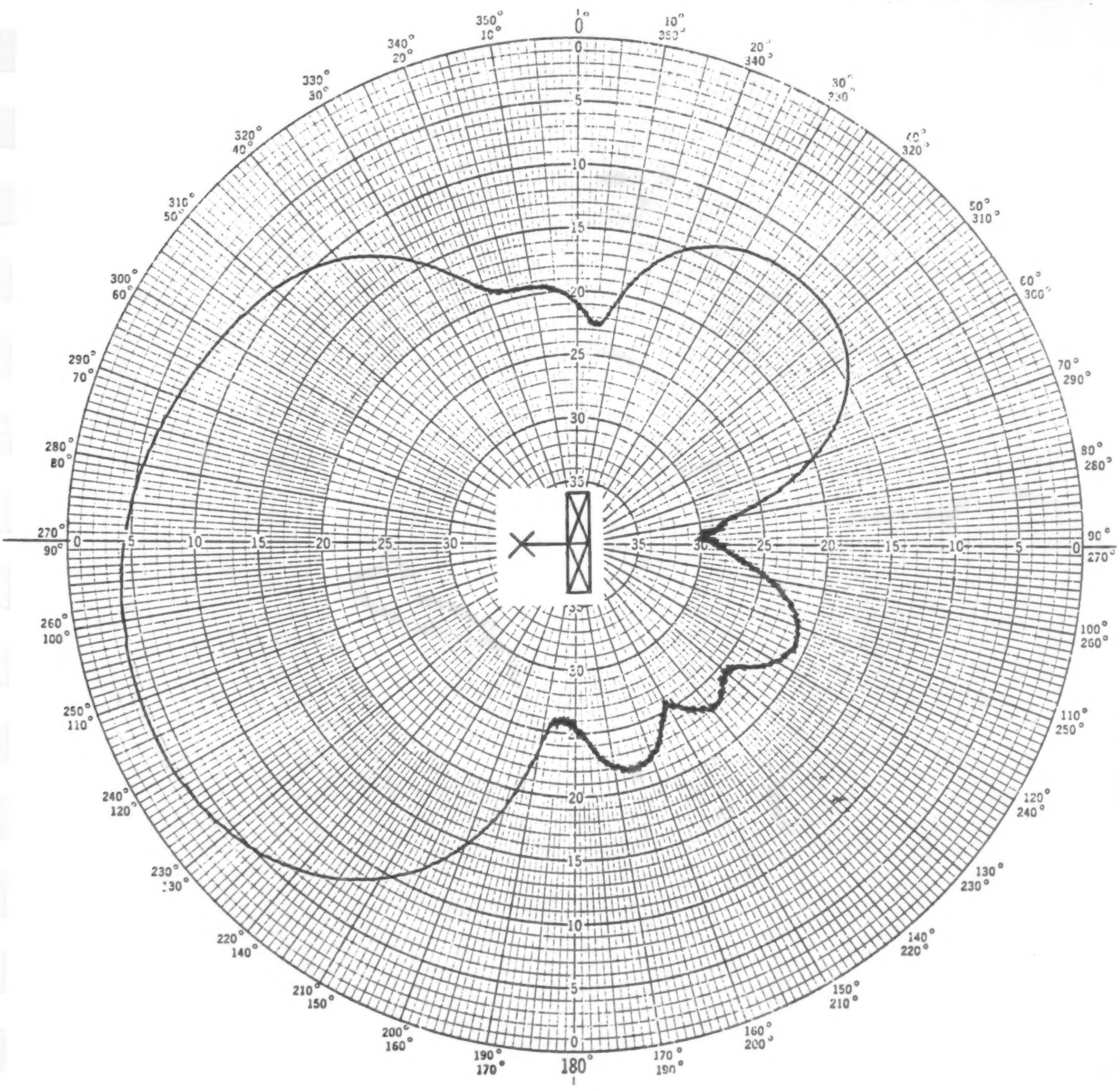
RING RADIUS: 51"

MCi Micro Communications Inc.

DATE: 8/3/81

MODEL: D

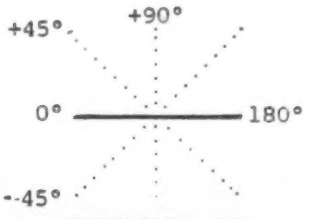
PATTERN NO.: DL5



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 22.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

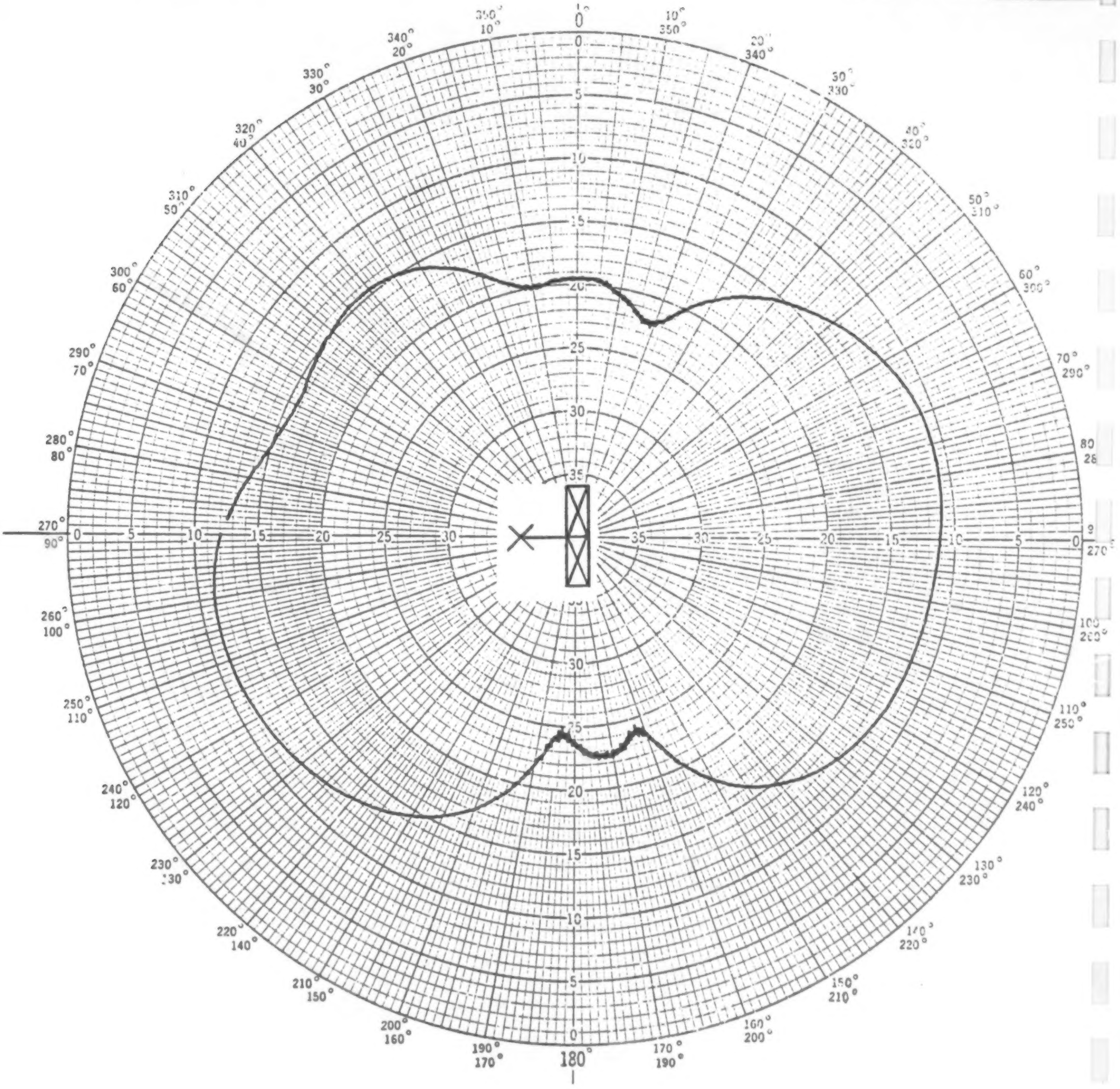
RING RADIUS: 51"

Micro
Communications
Inc.

DATE: 8/3/81

MODEL: D

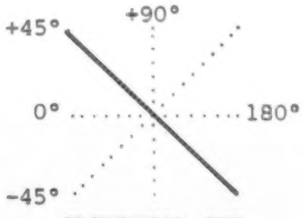
PATTERN NO.: DL6



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 22.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

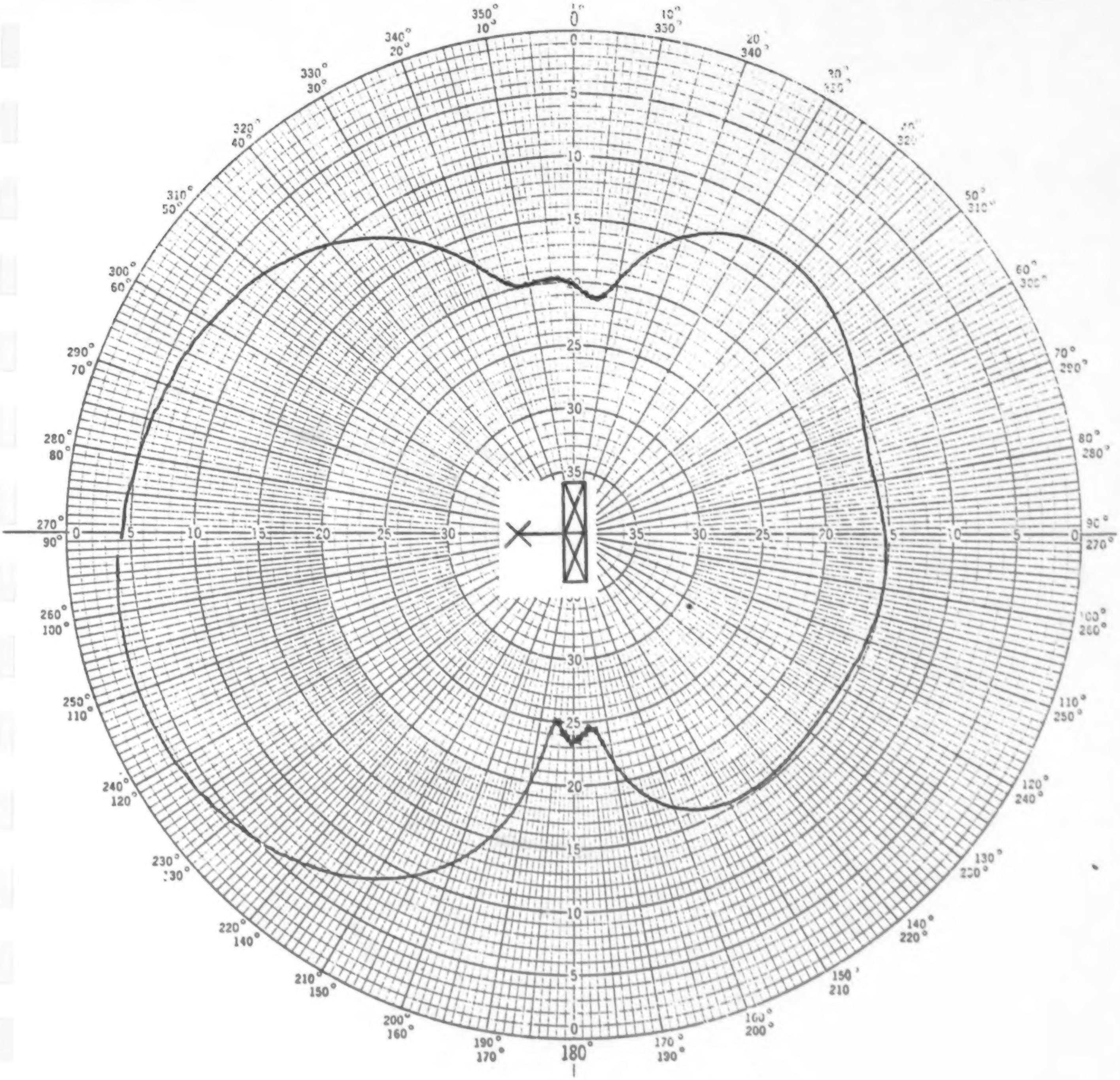
RING RADIUS: 51"

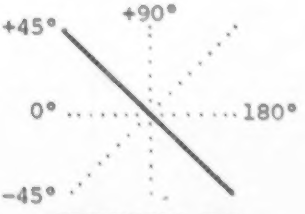
**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

PATTERN NO.: DL7





ELEVATION CUT

PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: VERT.

HEIGHT OF TRANSMITTING ANTENNA: 22.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

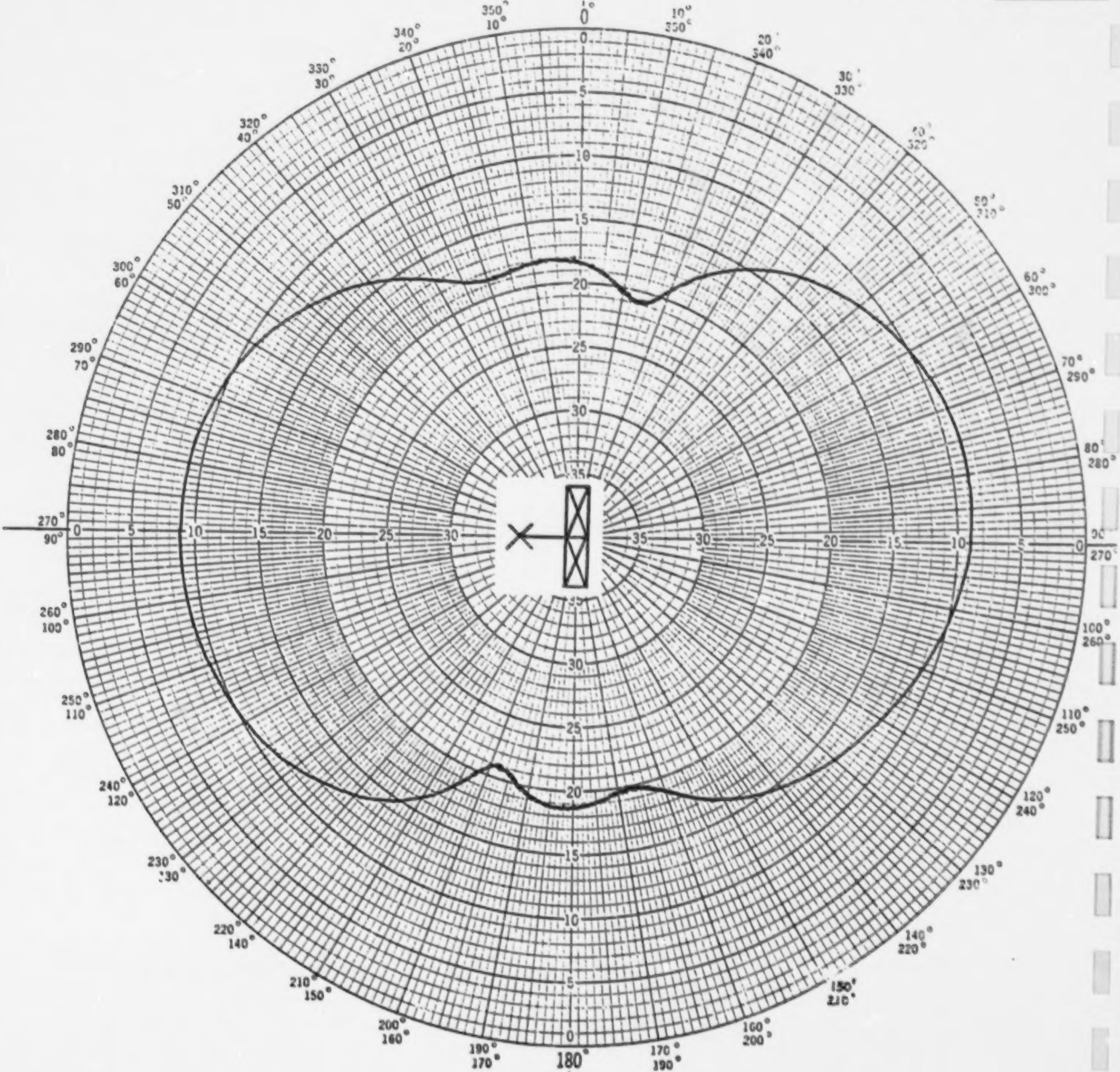
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

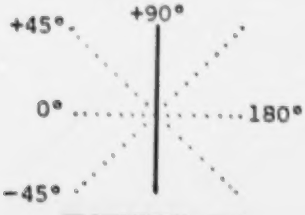
PATTERN NO.: DL8



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 22.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

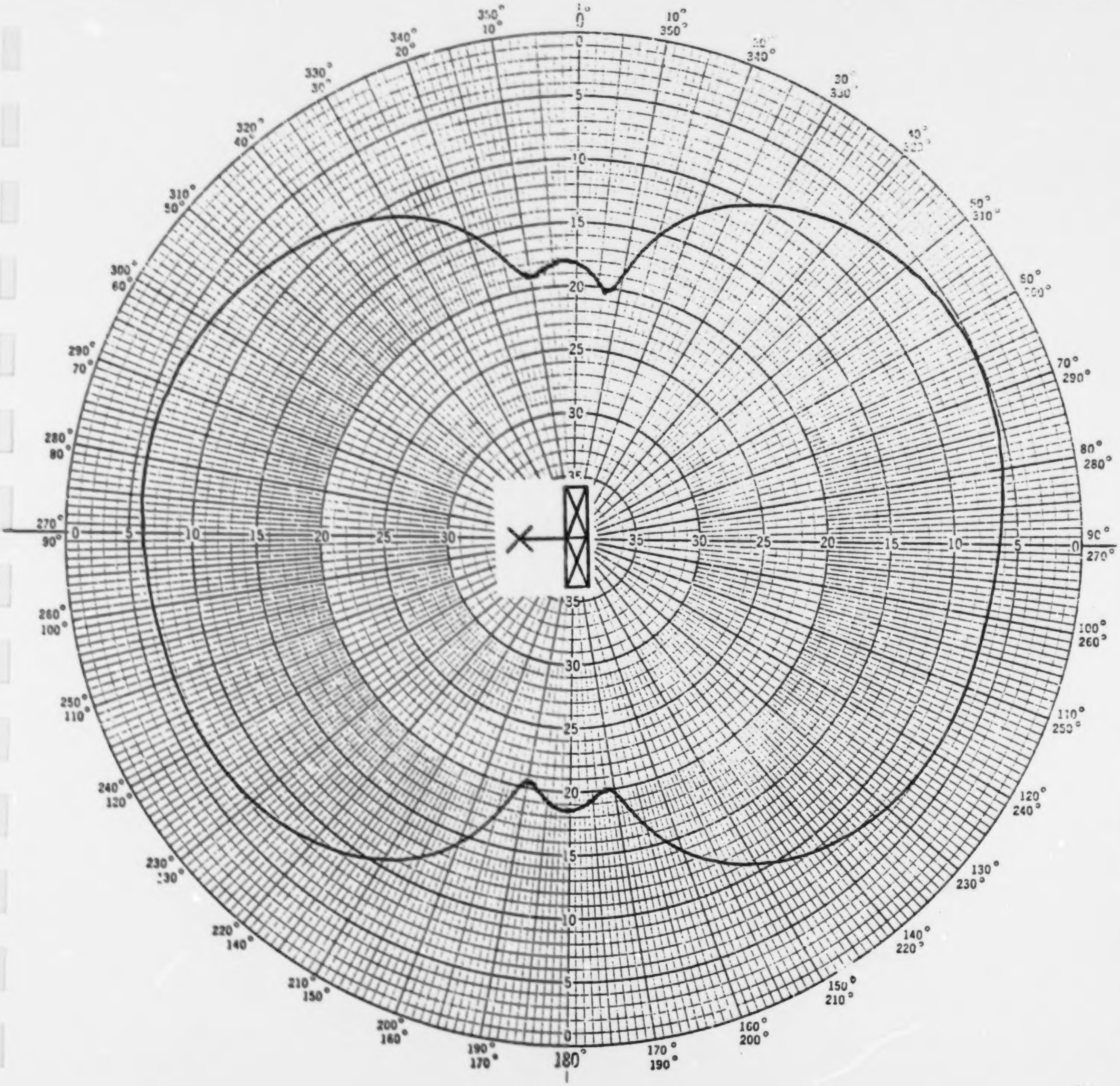
RING RADIUS: 51"

Micro Communications Inc.

DATE: 8/3/81

MODEL: D

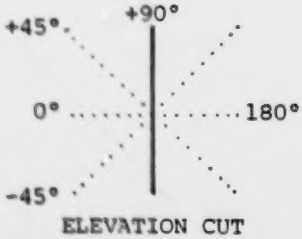
PATTERN NO.: DL9



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 22.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

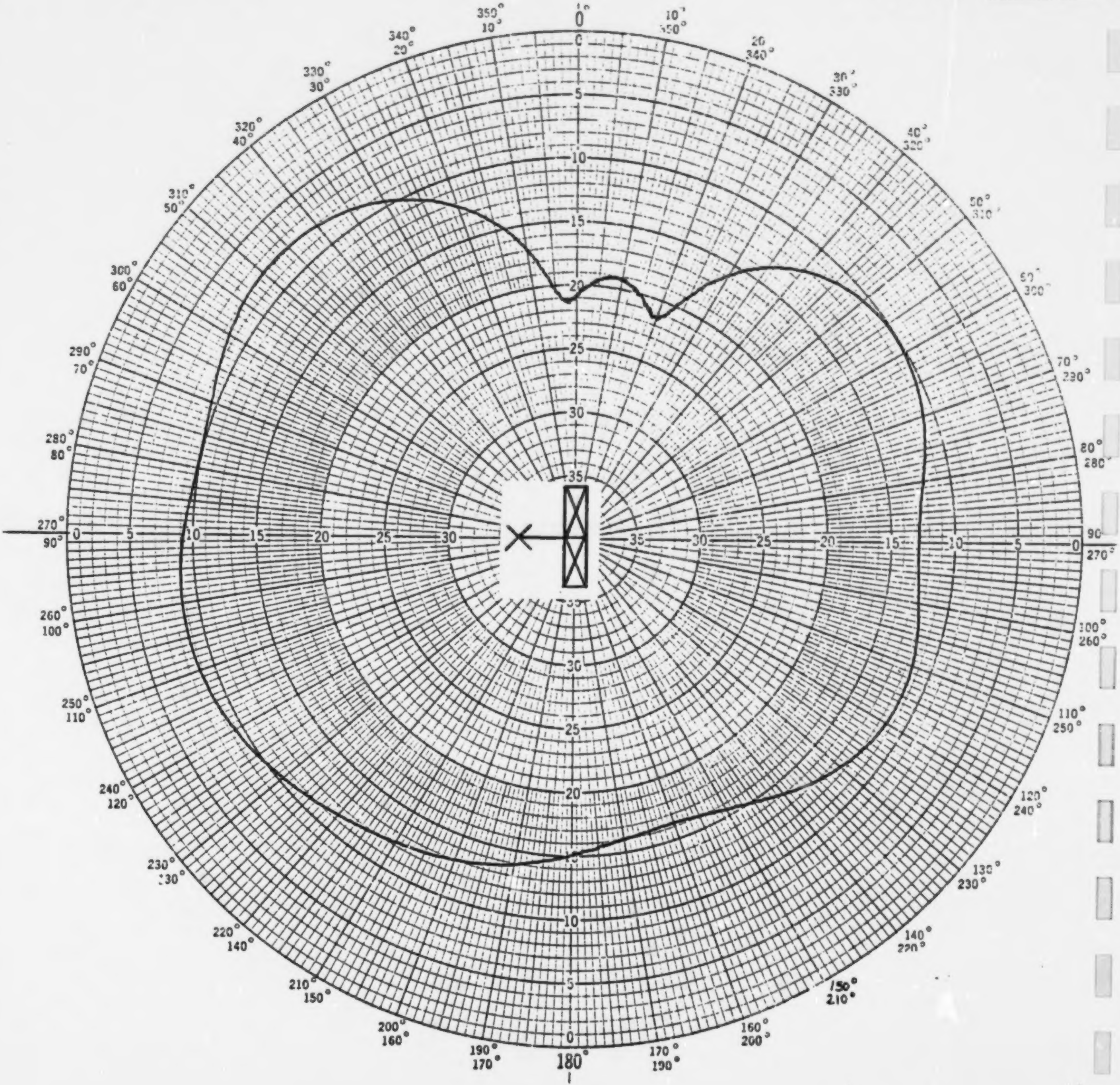
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

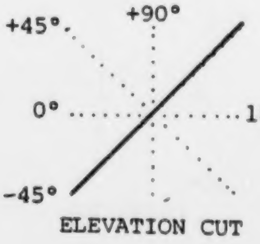
PATTERN NO.: DL10



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 22.5

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

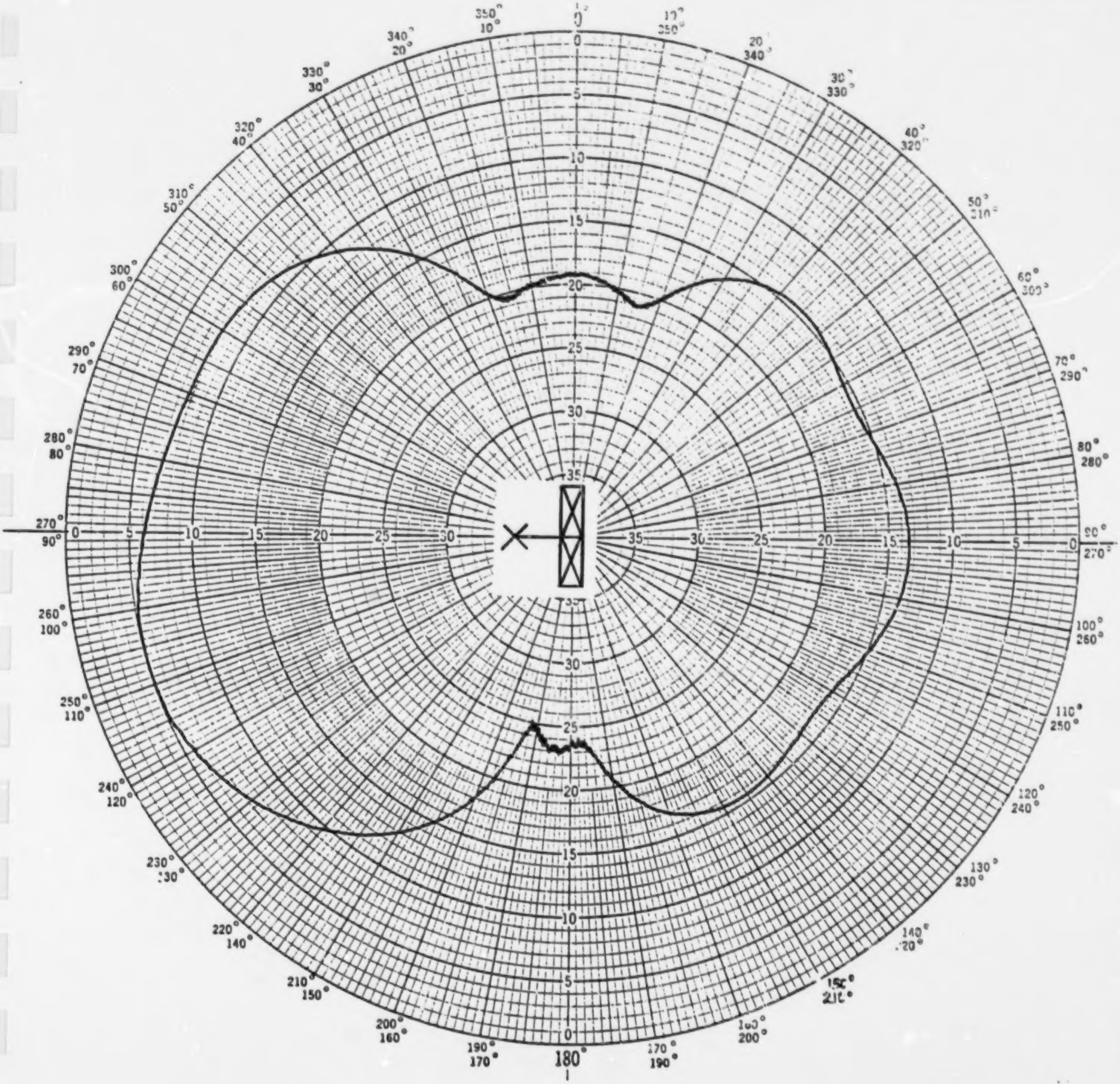
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

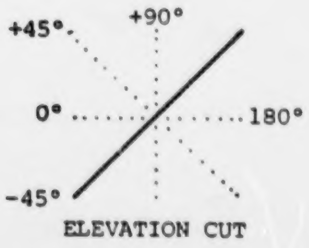
PATTERN NO.: DL11



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.



HEIGHT OF TRANSMITTING
ANTENNA: 22.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

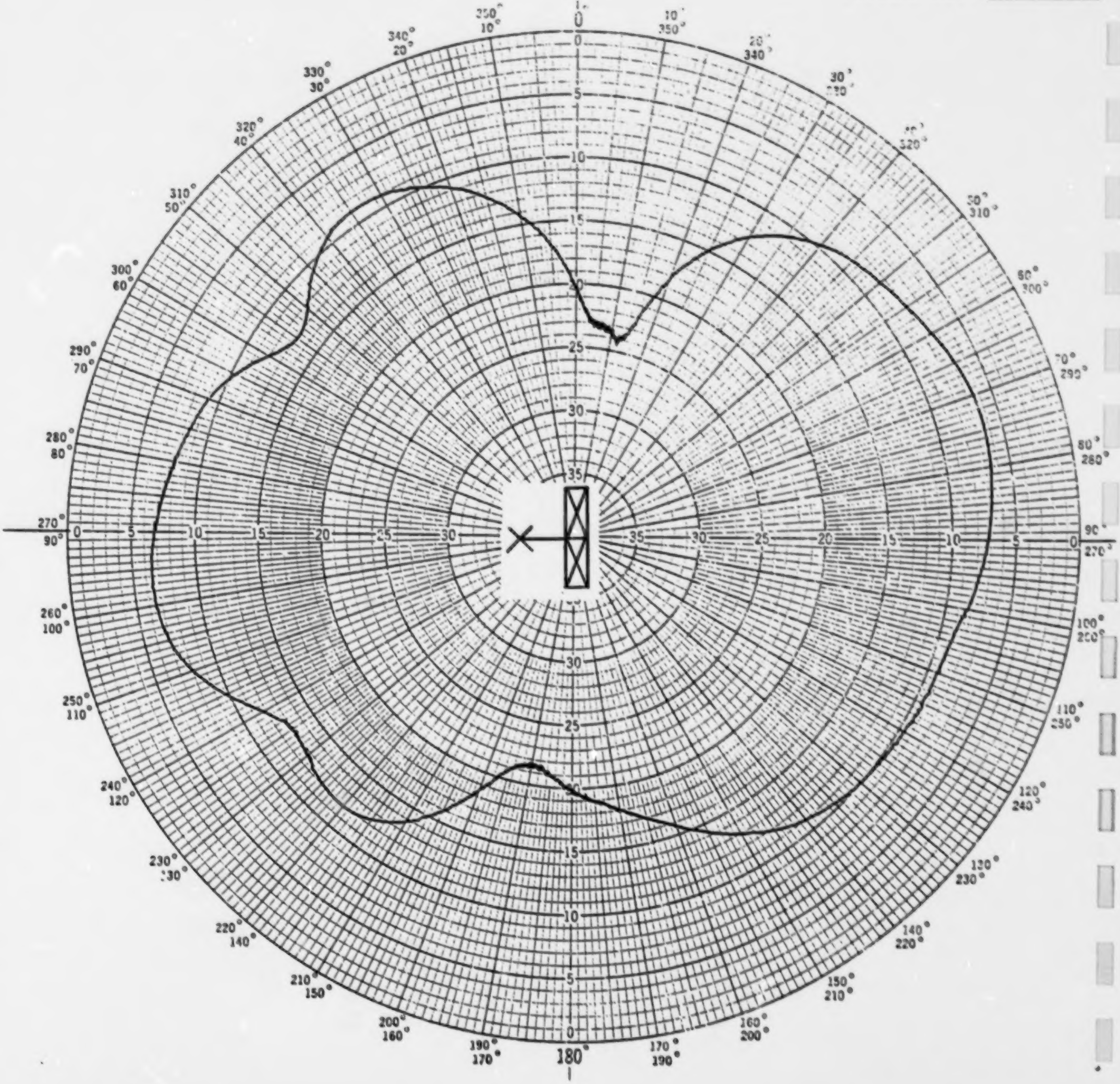
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

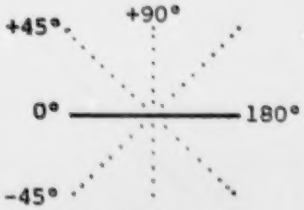
PATTERN NO.: DL12



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 22.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

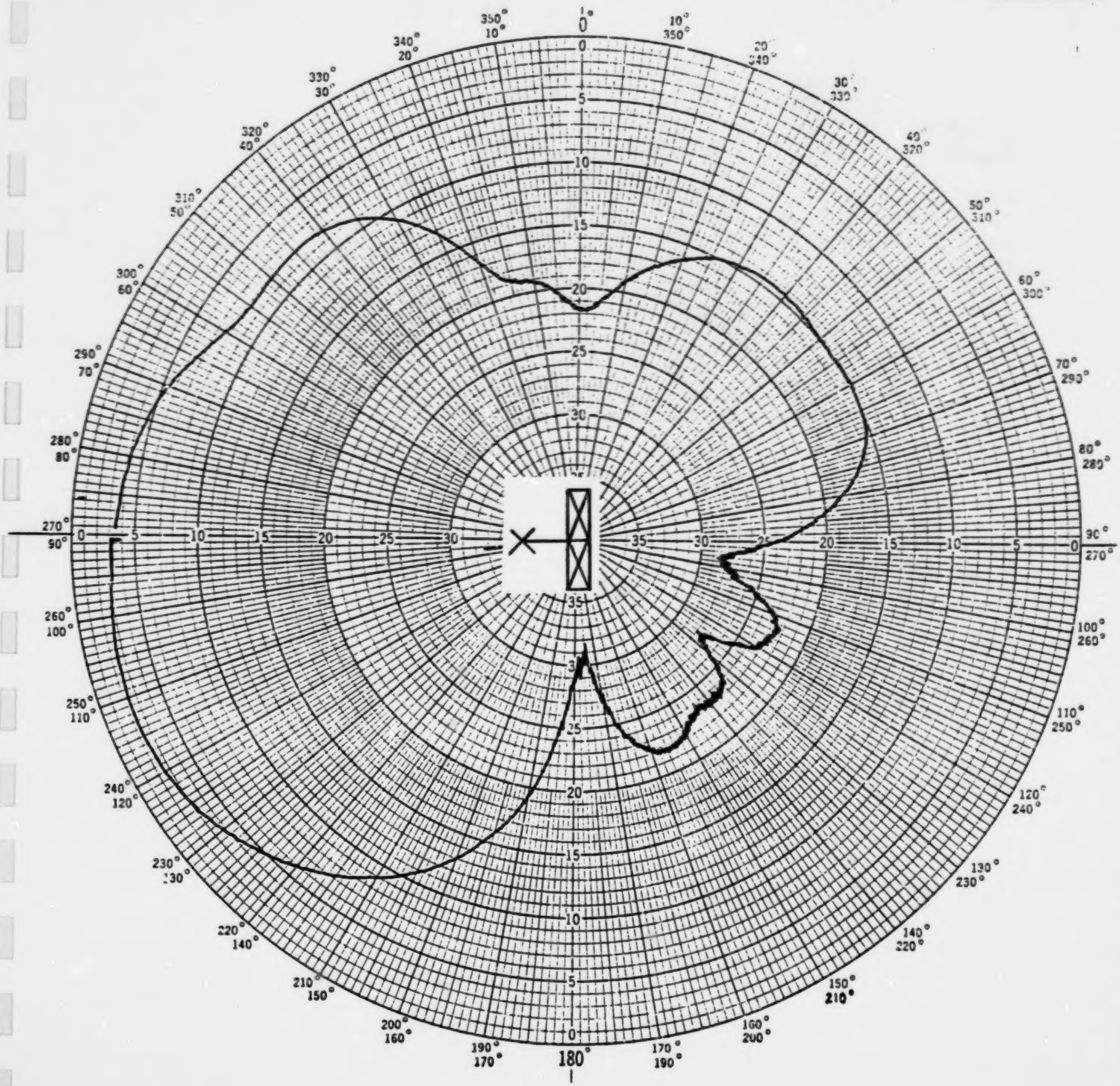
RING RADIUS: 51"

**Micro Communications Inc.**

DATE: 8/3/81

MODEL: D

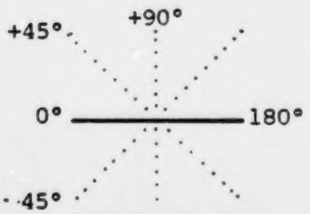
PATTERN NO.: DL13



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA:

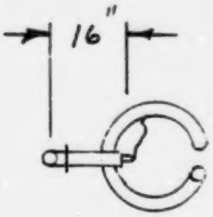
DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

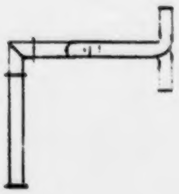
RING RADIUS:

## MODEL "E"
## FREE SPACE MEASUREMENTS
July 28, 1981

| PATTERN NUMBER | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLAR-IZATION | REMARKS |
|---|---|---|---|---|
| EFS1 (*193) | 28.5 | Axial Ratio | | |
| EFS2 (194) | 28.5 | Azimuth | Hoz. | |
| EFS3 (195) | 28.5 | Azimuth | Vert. | |
| EFS4 (196) | 28.5 | Elevation | Hoz. | 0-180 cut |
| EFS5 (197) | 28.5 | Elevation | Vert. | 0-180 cut |
| EFS6 (198) | 28.5 | Elevation | Hoz. | +45 cut |
| EFS7 (199) | 28.5 | Elevation | Vert. | +45 cut |
| EFS8 (200) | 28.5 | Elevation | Hoz. | +90 cut |
| EFS9 (201) | 28.5 | Elevation | Vert. | +90 cut |
| EFS10 (202) | 28.5 | Elevation | Hoz. | -45 cut |
| EFS11 (203) | 28.5 | Elevation | Vert. | -45 cut |

*Page Numbers



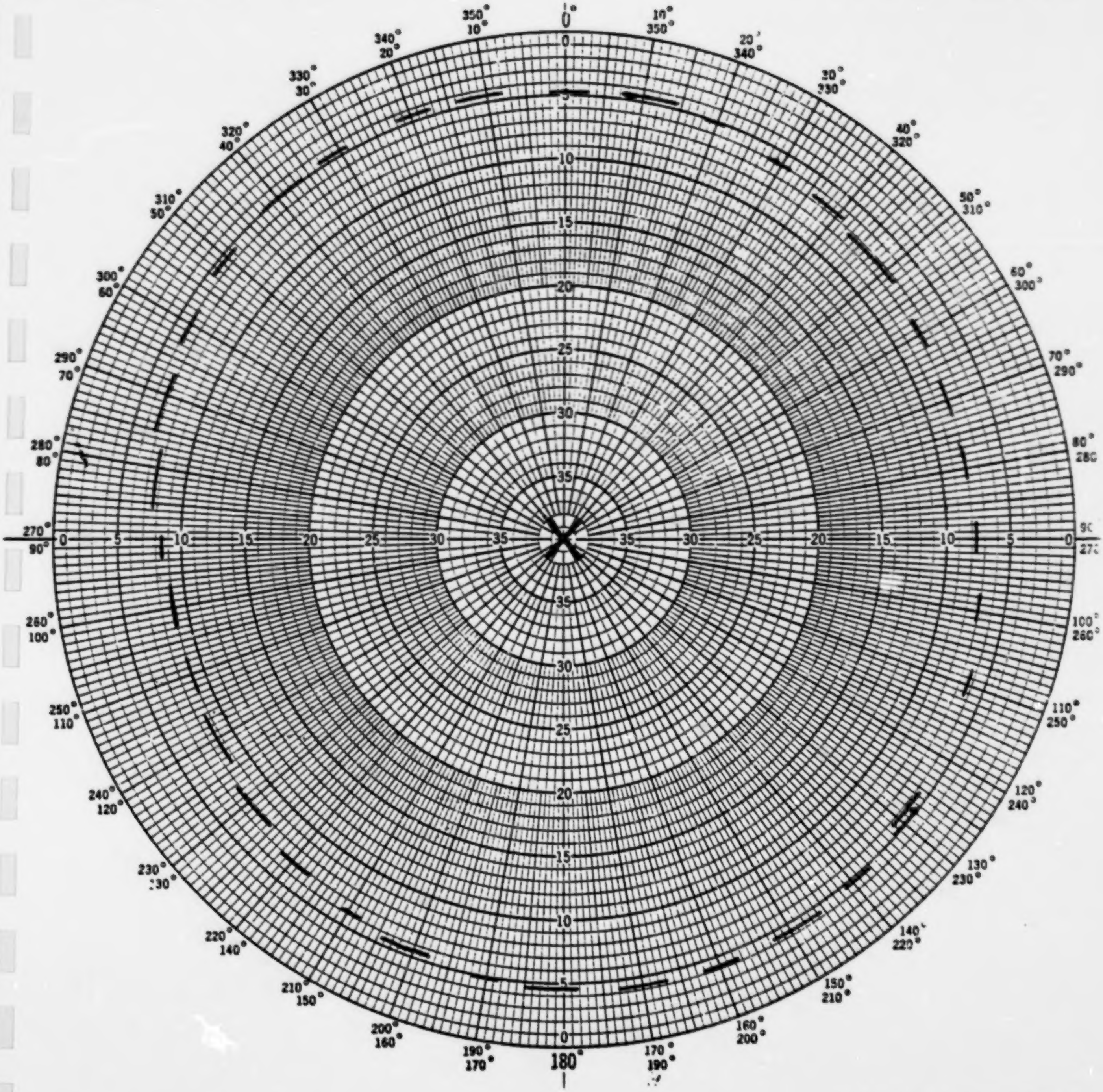


**Micro Communications Inc.**

DATE: 7/28/81

MODEL: E

PATTERN NO.: EFS1



PATTERN: AXIAL RATIO

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: ______

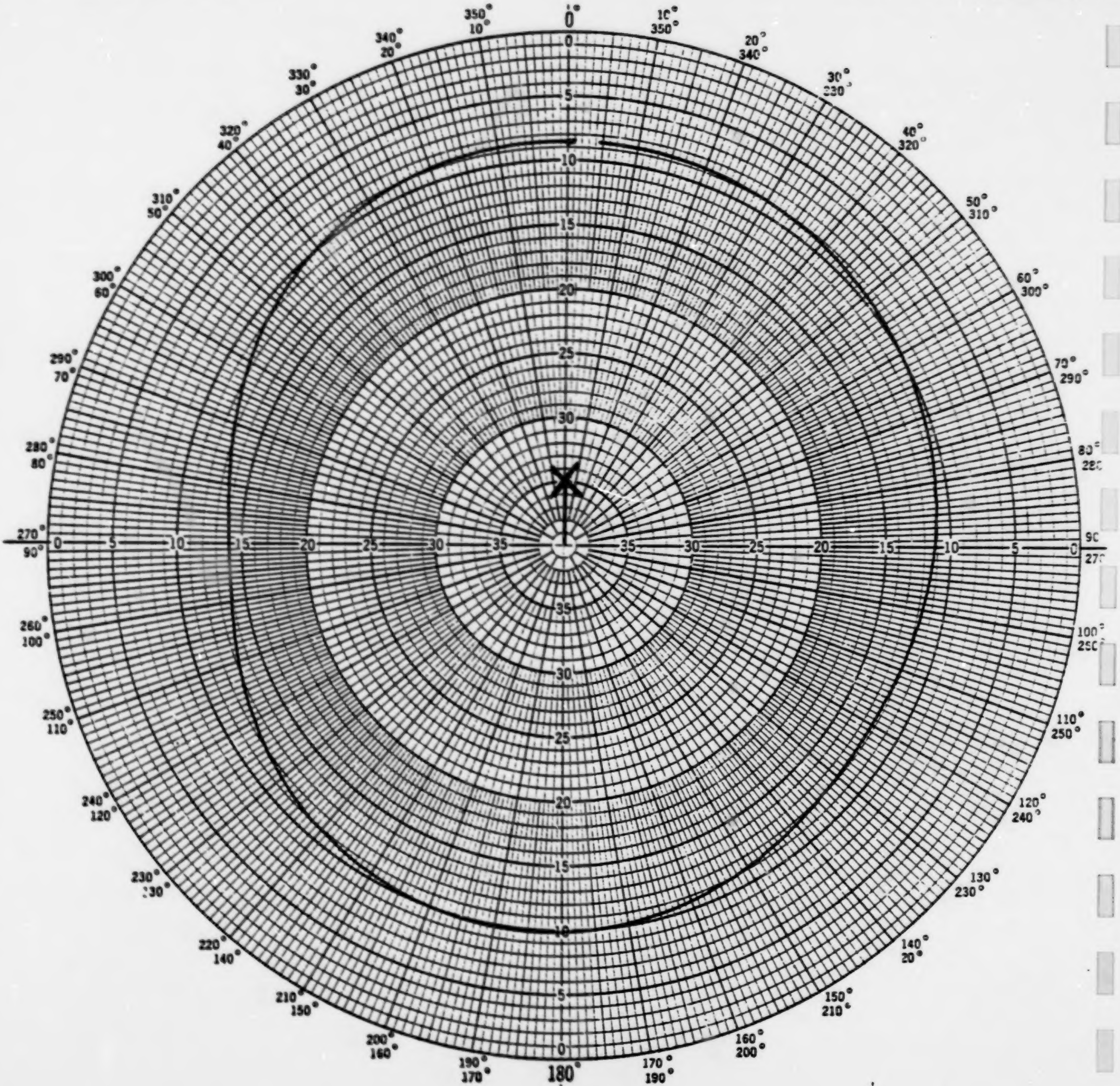
HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 16"

**Micro Communications Inc.**

DATE: 7/28/81
MODEL: E
PATTERN NO.: EFS2



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

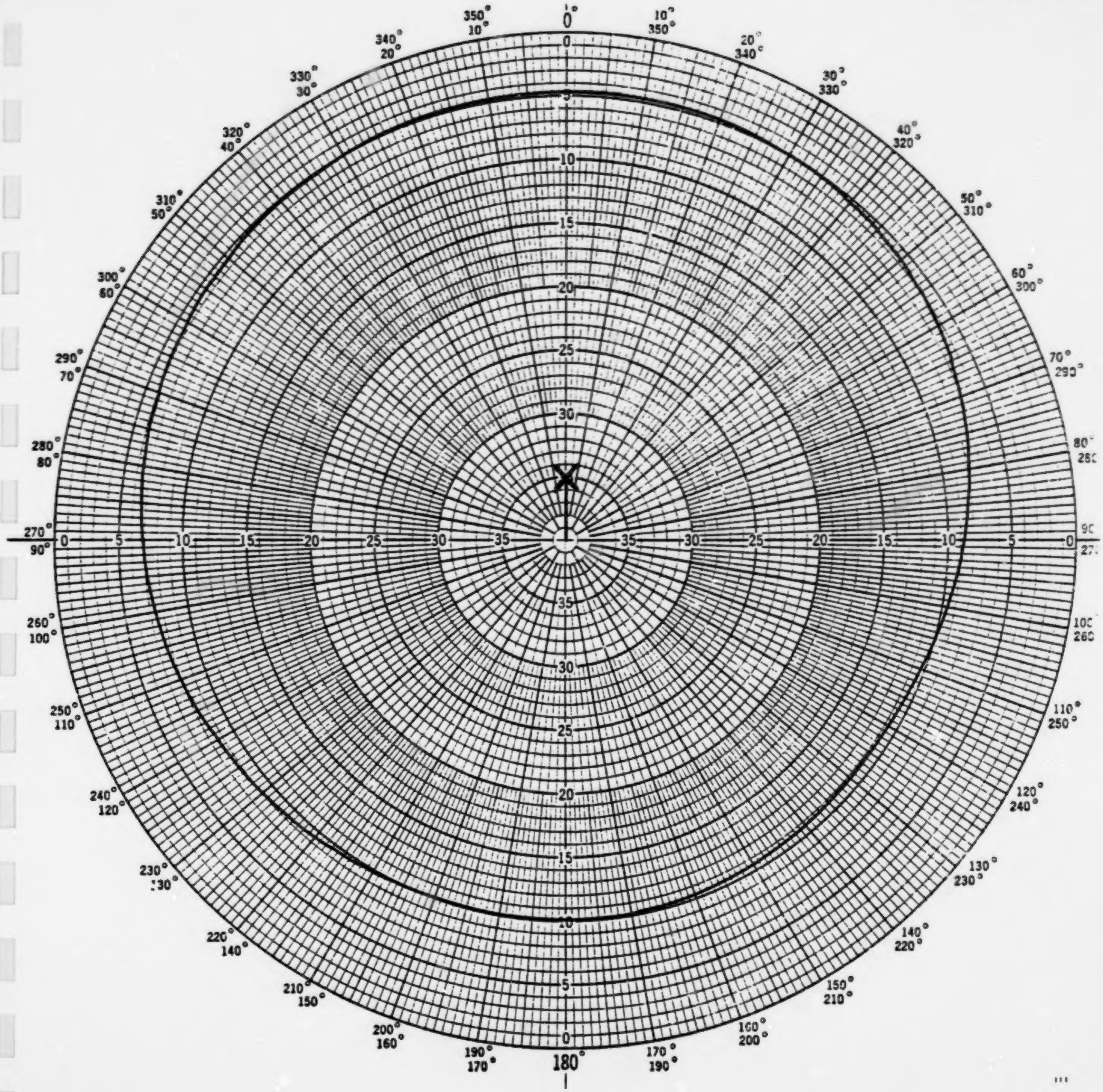
RING RADIUS: 16"

**Micro Communications Inc.**

DATE: 7/28/81

MODEL: E

PATTERN NO.: EFS3



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

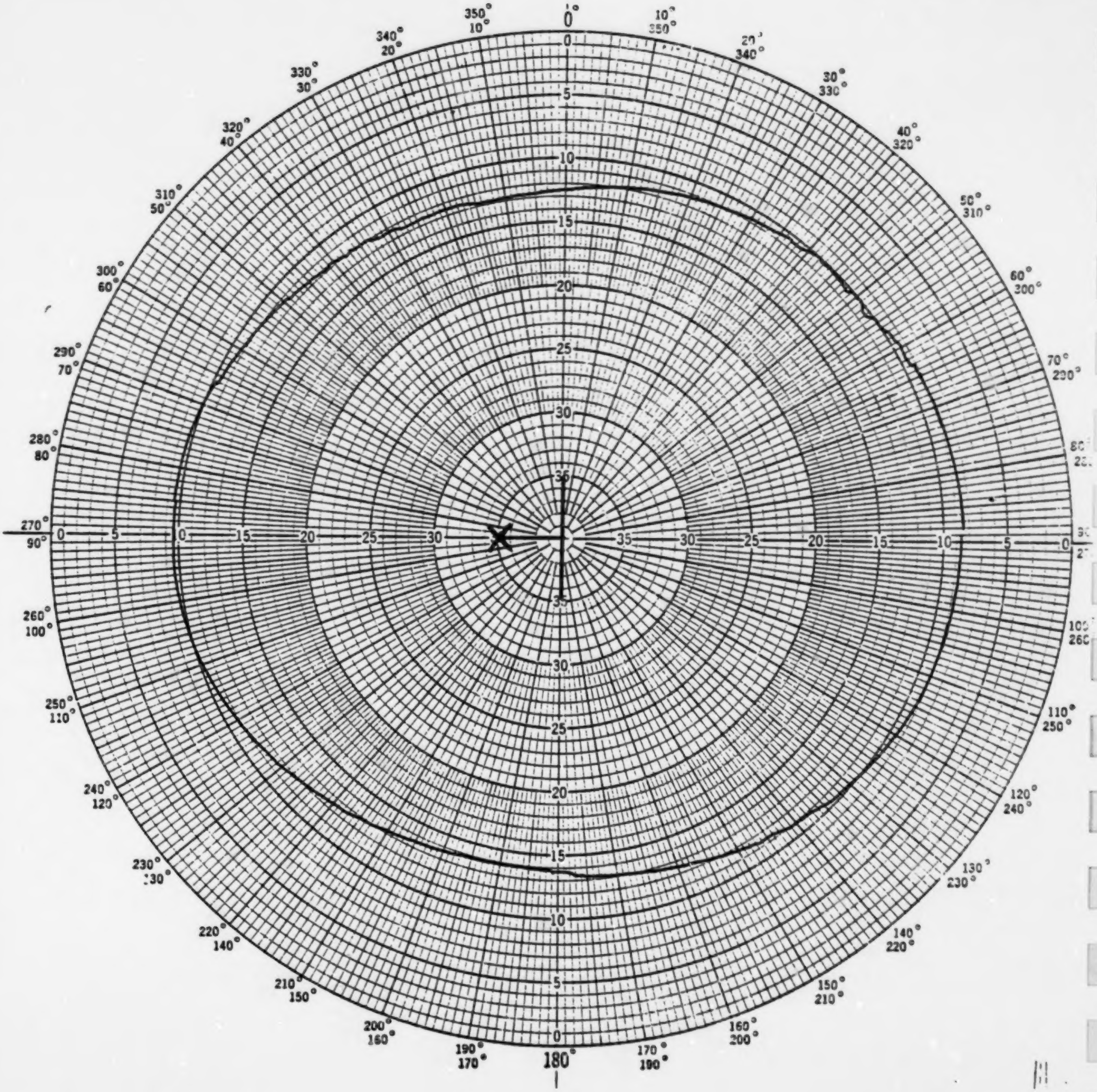
RING RADIUS: 16"

**Micro Communications Inc.**

DATE: 7/28/81

MODEL: E

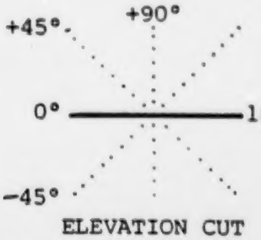
PATTERN NO.: EFS4



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FREE SPACE

TRANSMITTING ANTENNA POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

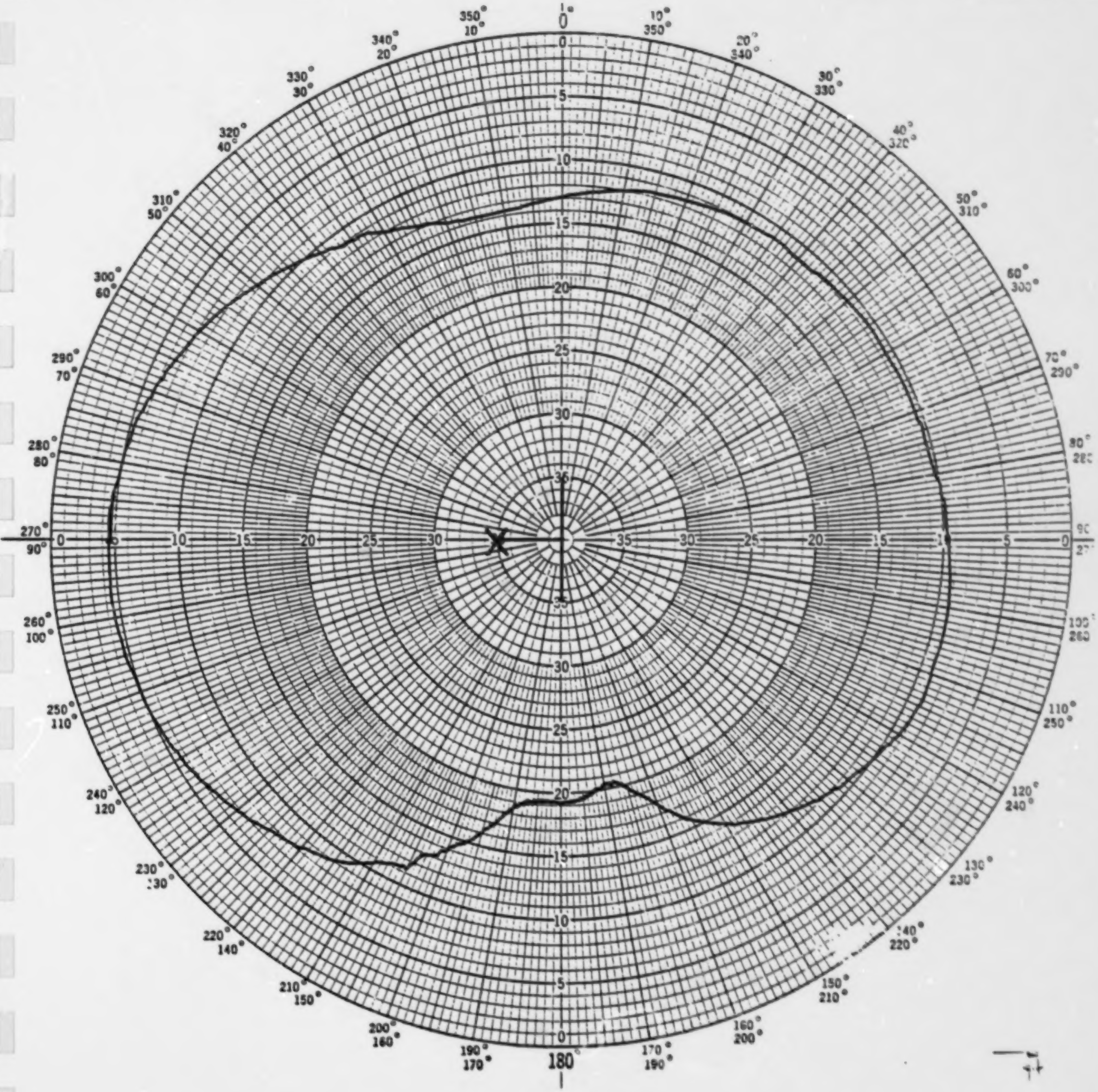
RING RADIUS: 16"

**Micro Communications Inc.**

DATE: 7/28/81

MODEL: E

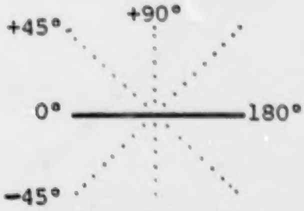
PATTERN NO.: EFS5



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

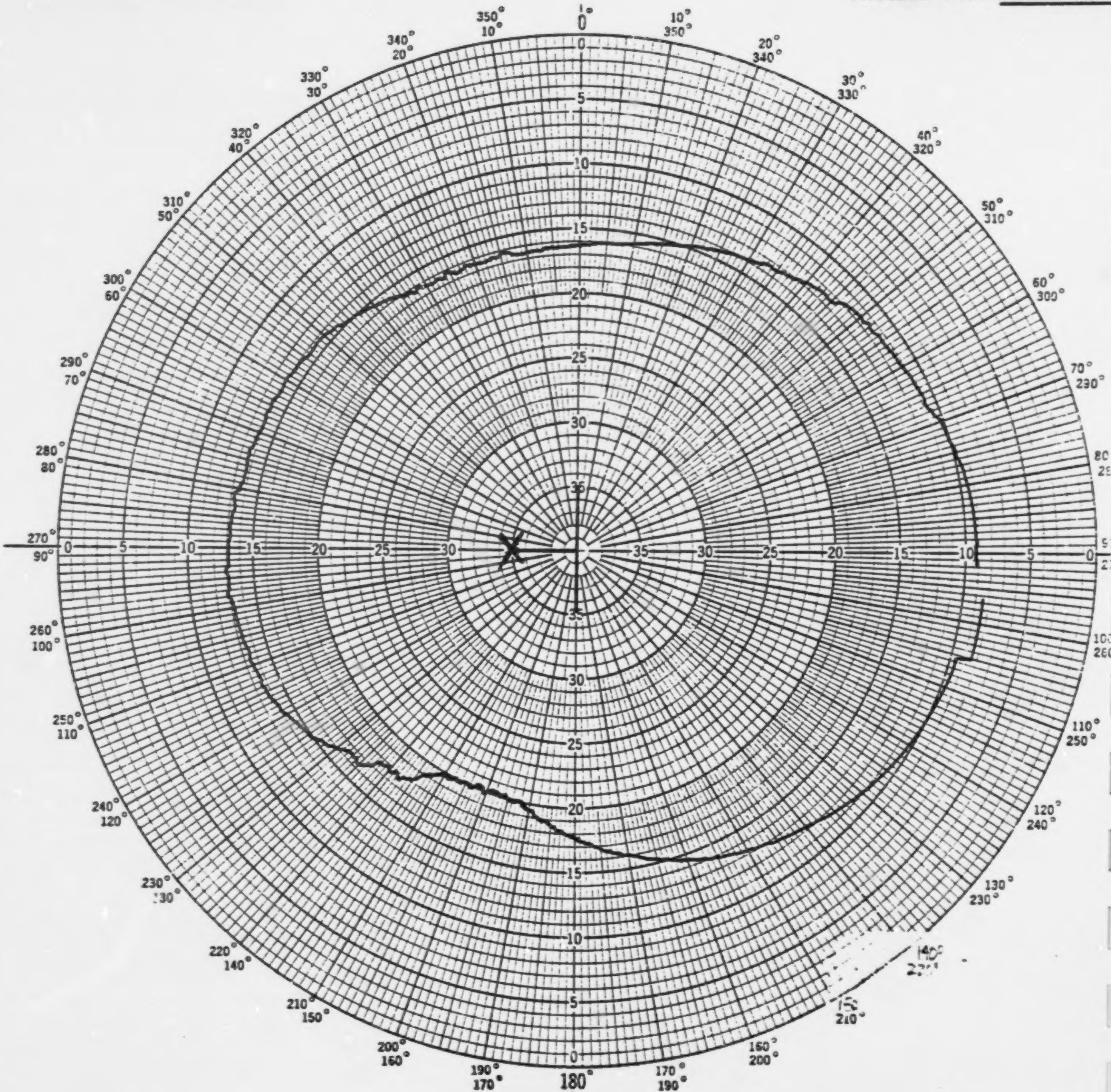
RING RADIUS: 16"

**Micro Communications Inc.**

DATE: 7/28/81

MODEL: E

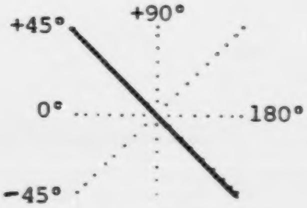
PATTERN NO.: EFS6



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

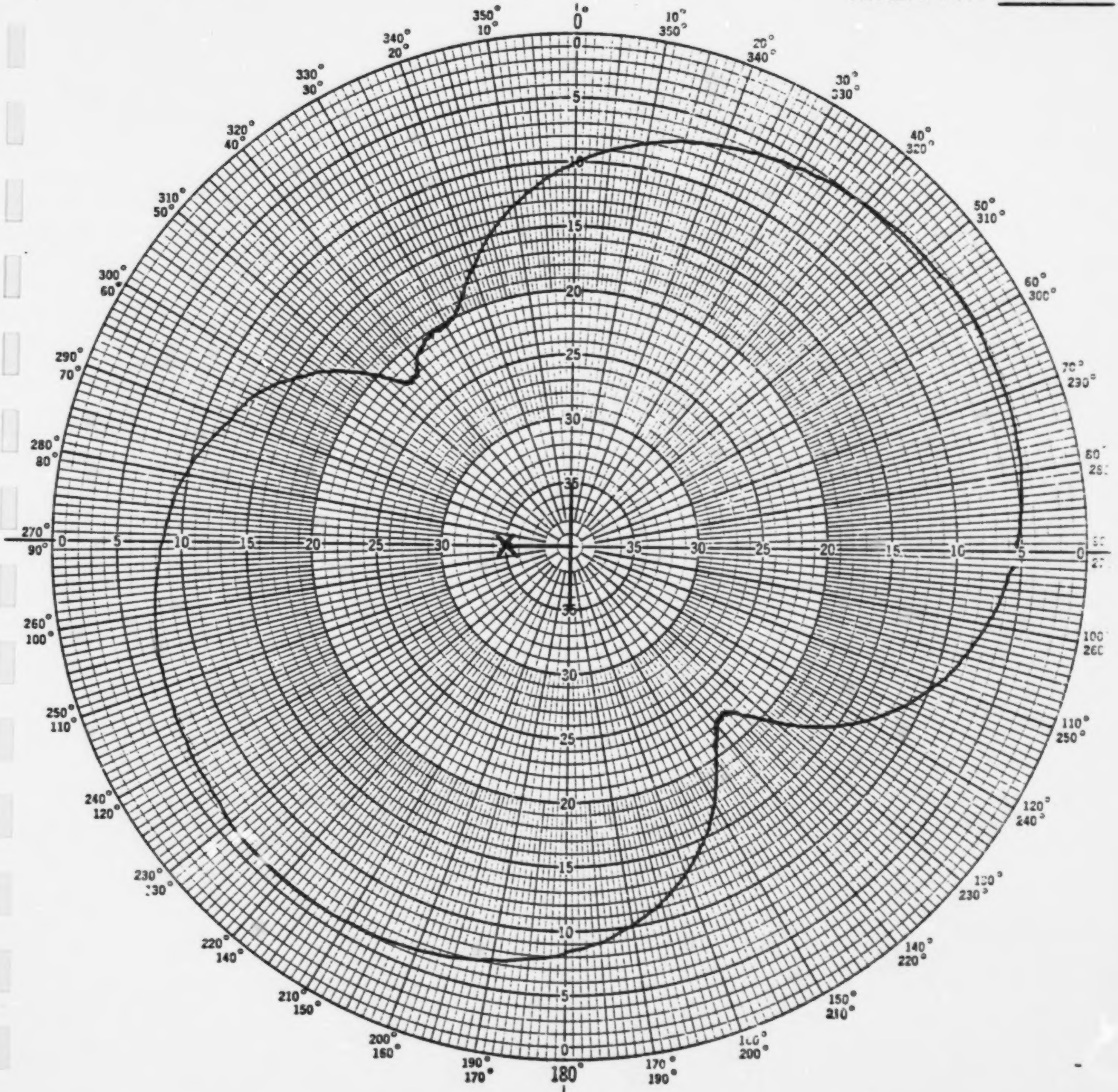
RING RADIUS: 16"

**Micro Communications Inc.**

DATE: 7/28/81

MODEL: E

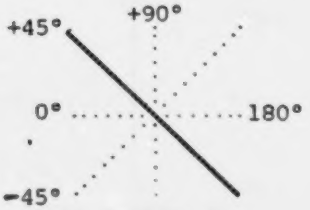
PATTERN NO.: EFS7



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 28.5

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

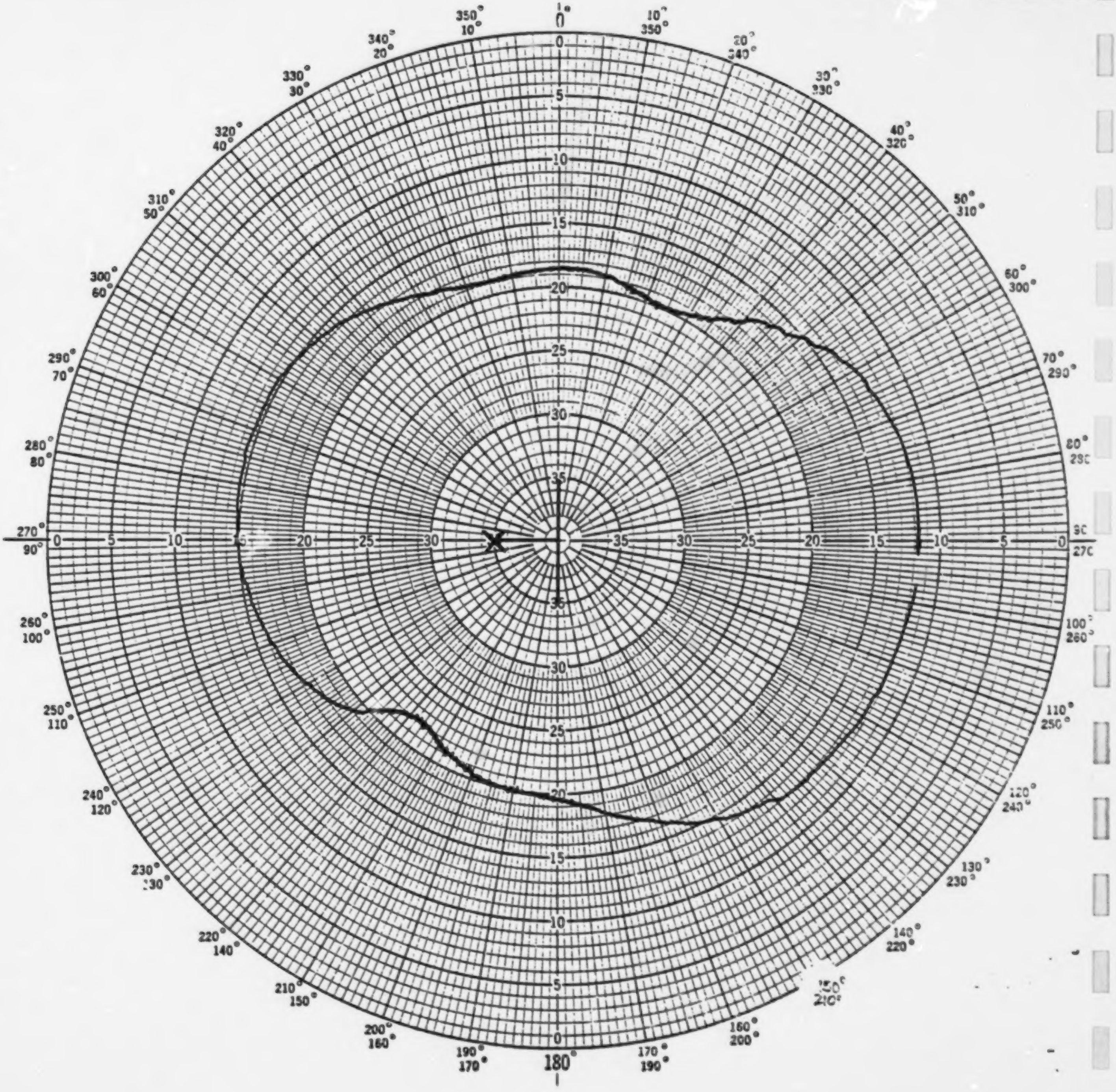
RING RADIUS: 16"

**Micro Communications Inc.**

DATE: 7/28/81

MODEL: E

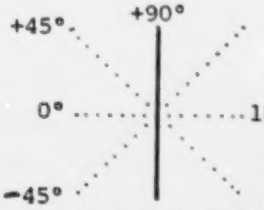
PATTERN NO.: EFS8



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

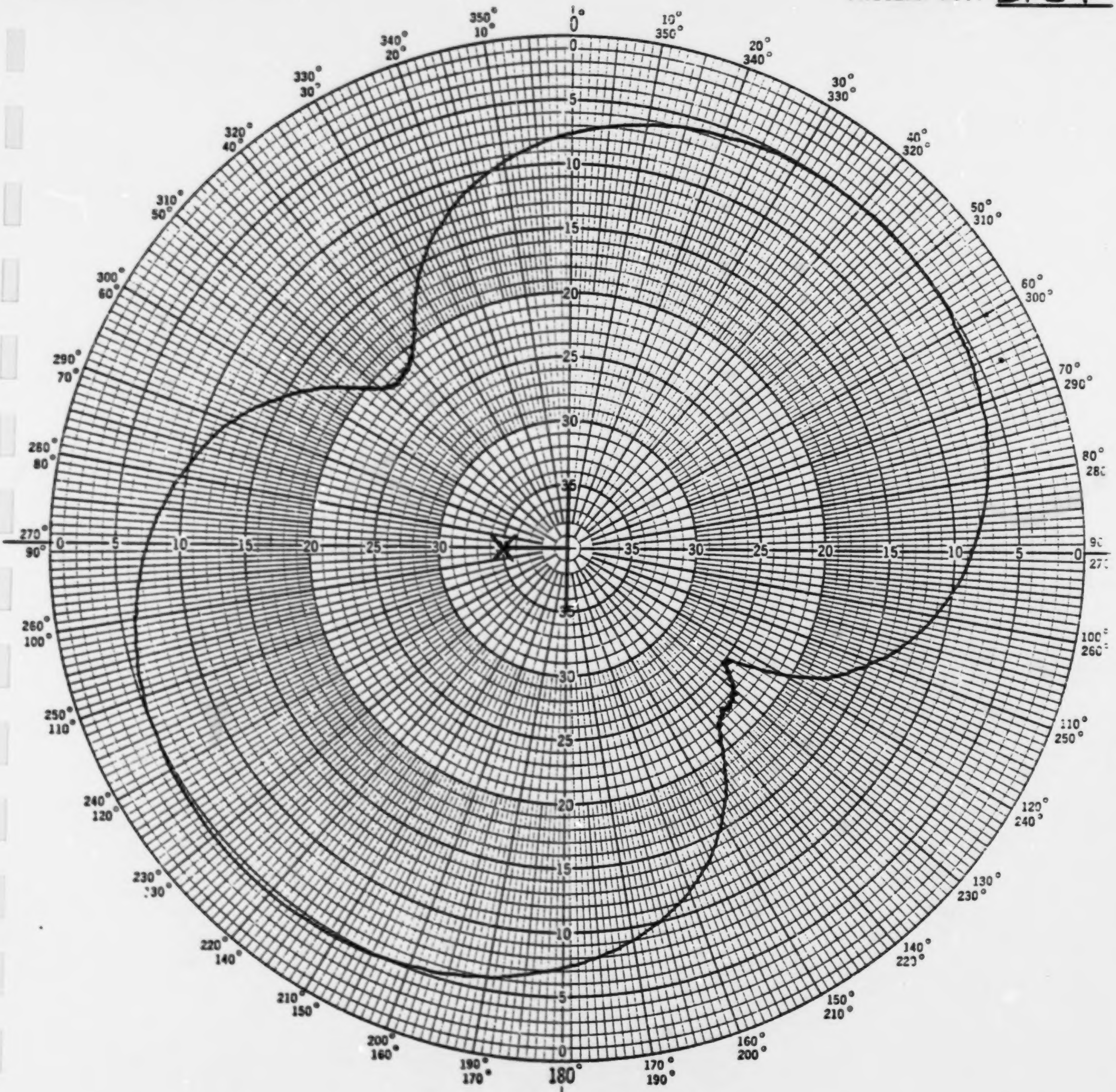
RING RADIUS: 16"

**Micro Communications Inc.**

DATE: 7/28/81

MODEL: E

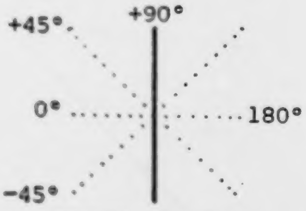
PATTERN NO.: EFS9



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FREE SPACE

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

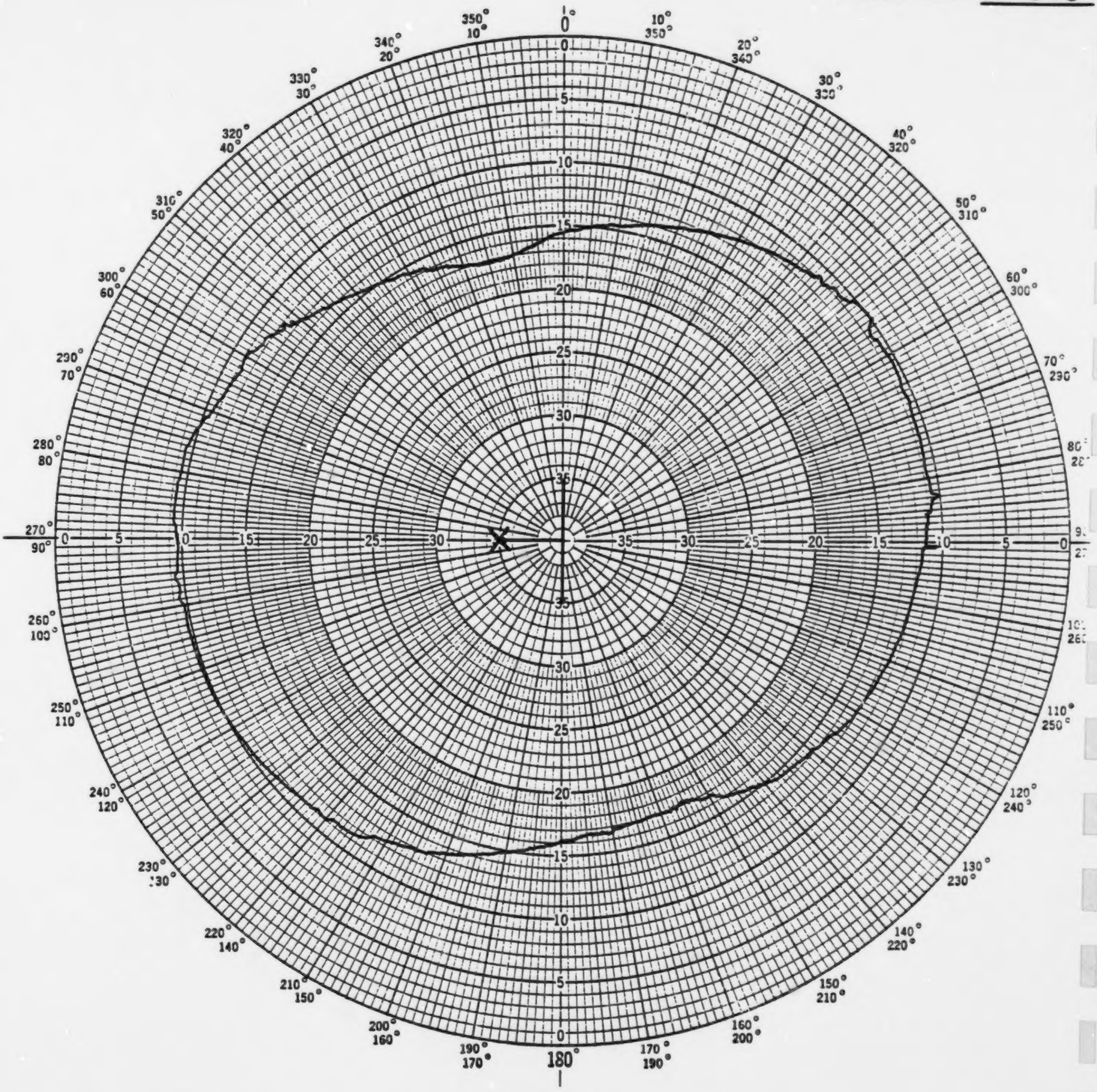
RING RADIUS: 16"

**Micro Communications Inc.**

DATE: 7/28/81

MODEL: E

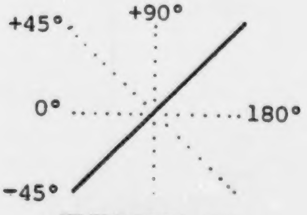
PATTERN NO.: EFS10



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 28.5

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

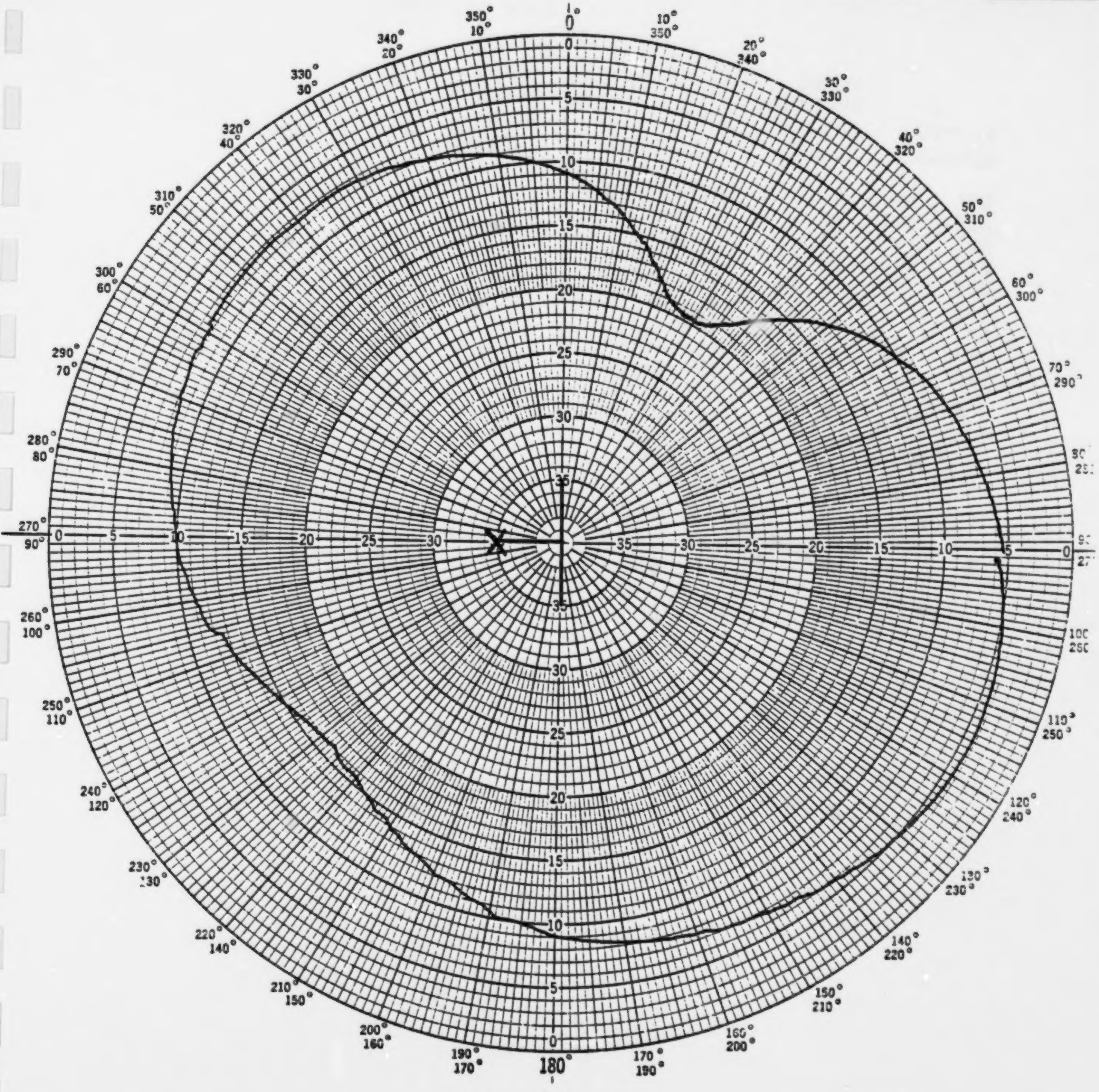
RING RADIUS: 16"

**Micro Communications Inc.**

DATE: 7/28/81

MODEL: E

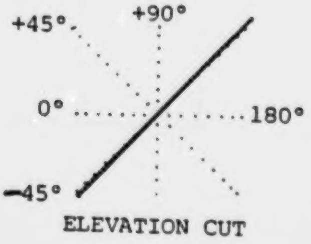
PATTERN NO.: EFS11



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FREE SPACE

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

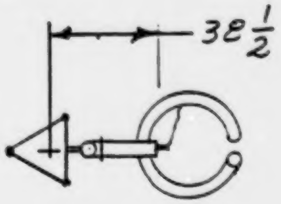
DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

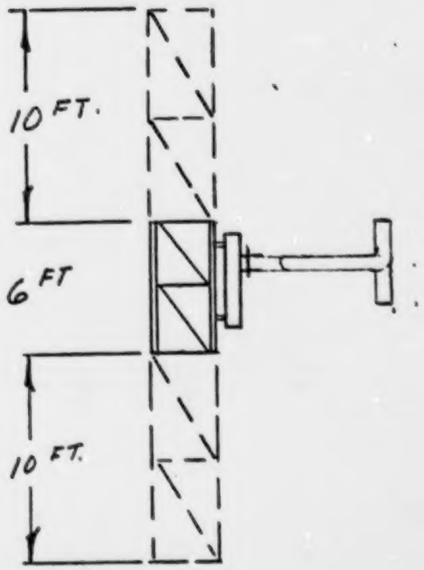
RING RADIUS: 16"

# MODEL "E"
# ANTENNA MOUNTED
# ON TOWER FACE
July 27, 1981

| PATTERN NUMBER * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLARIZATION | REMARKS |
|---|---|---|---|---|
| EF1 (205) | 28.5 | Axial Ratio | | |
| EF2 (206) | 28.5 | Azimuth | Hoz. | |
| EF3 (207) | 28.5 | Azimuth | Vert. | |
| EF4 (208) | 28.5 | Elevation | Hoz. | 0-180 cut |
| EF5 (209) | 28.5 | Elevation | Vert. | 0-180 cut |
| EF6 (210) | 28.5 | Elevation | Hoz. | +45 cut |
| EF7 (211) | 28.5 | Elevation | Vert. | +45 cut |
| EF8 (212) | 28.5 | Elevation | Hoz. | +90 cut |
| EF9 (213) | 28.5 | Elevation | Vert. | +90 cut |
| EF10 (214) | 28.5 | Elevation | Hoz. | -45 cut |
| EF11 (215) | 28.5 | Elevation | Vert. | -45 cut |
| EF12 (216) | 28.5 | Azimuth | Vert. | |
| EF13 (217) | 28.5 | Azimuth | Hoz. | |
| EF14 (218) | 28.5 | Azimuth | Hoz. | |

*Page Numbers



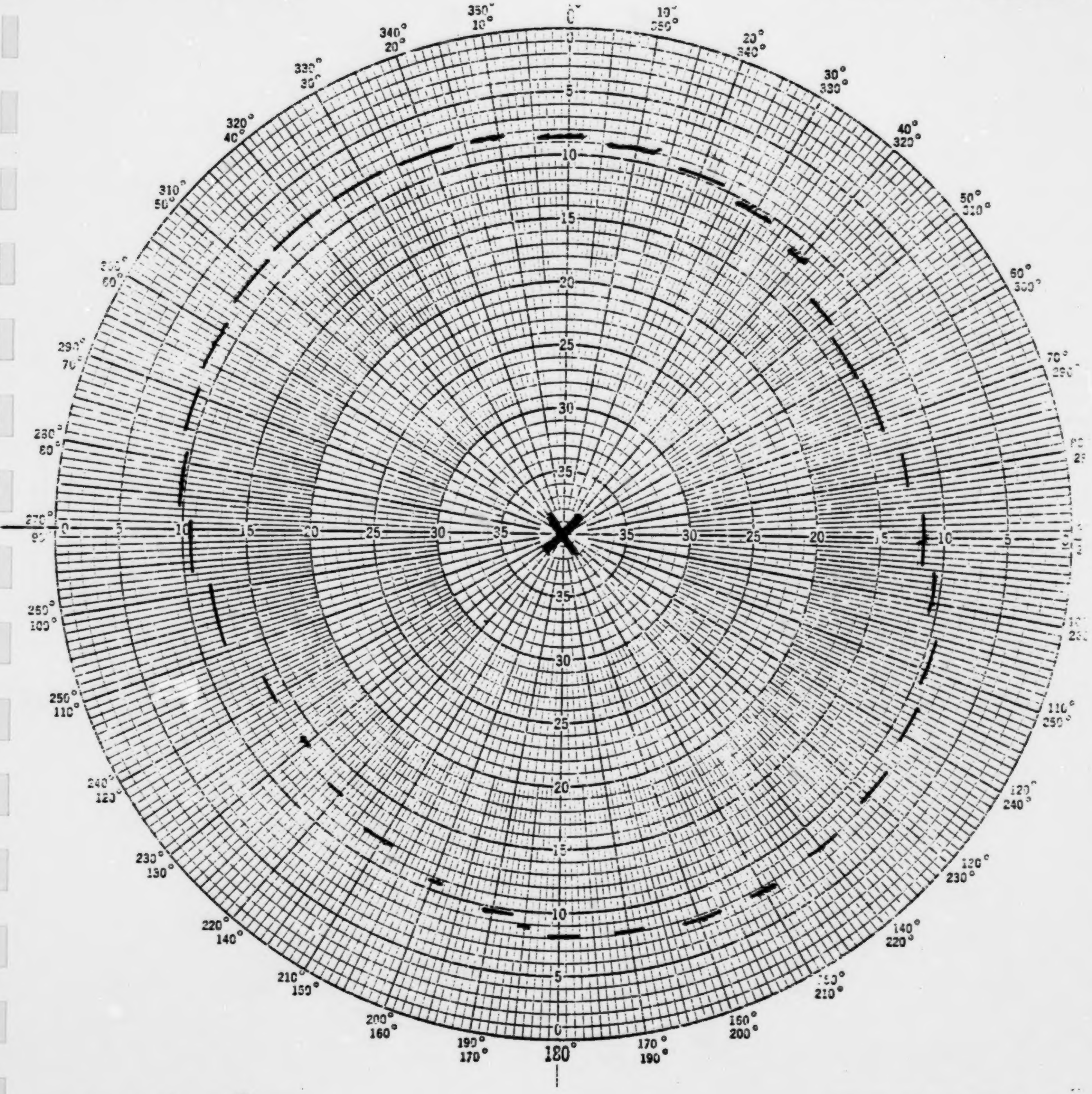


Micro
Communications
Inc.

DATE: 7/27/81

MODEL: E

PATTERN NO.: EF1



PATTERN: AXIAL RATIO

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: ______

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

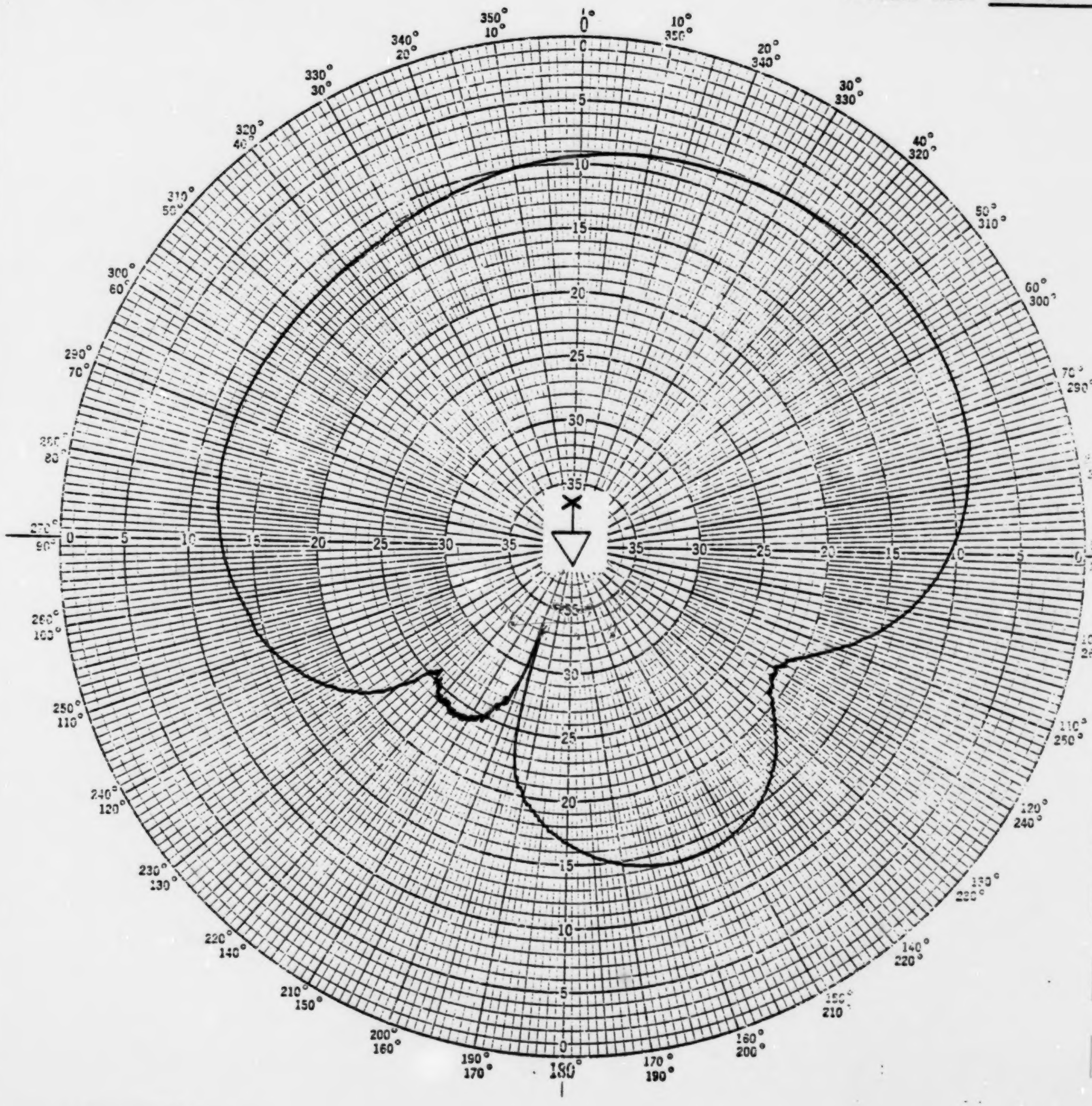
RING RADIUS: 38.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

PATTERN NO.: EF2



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

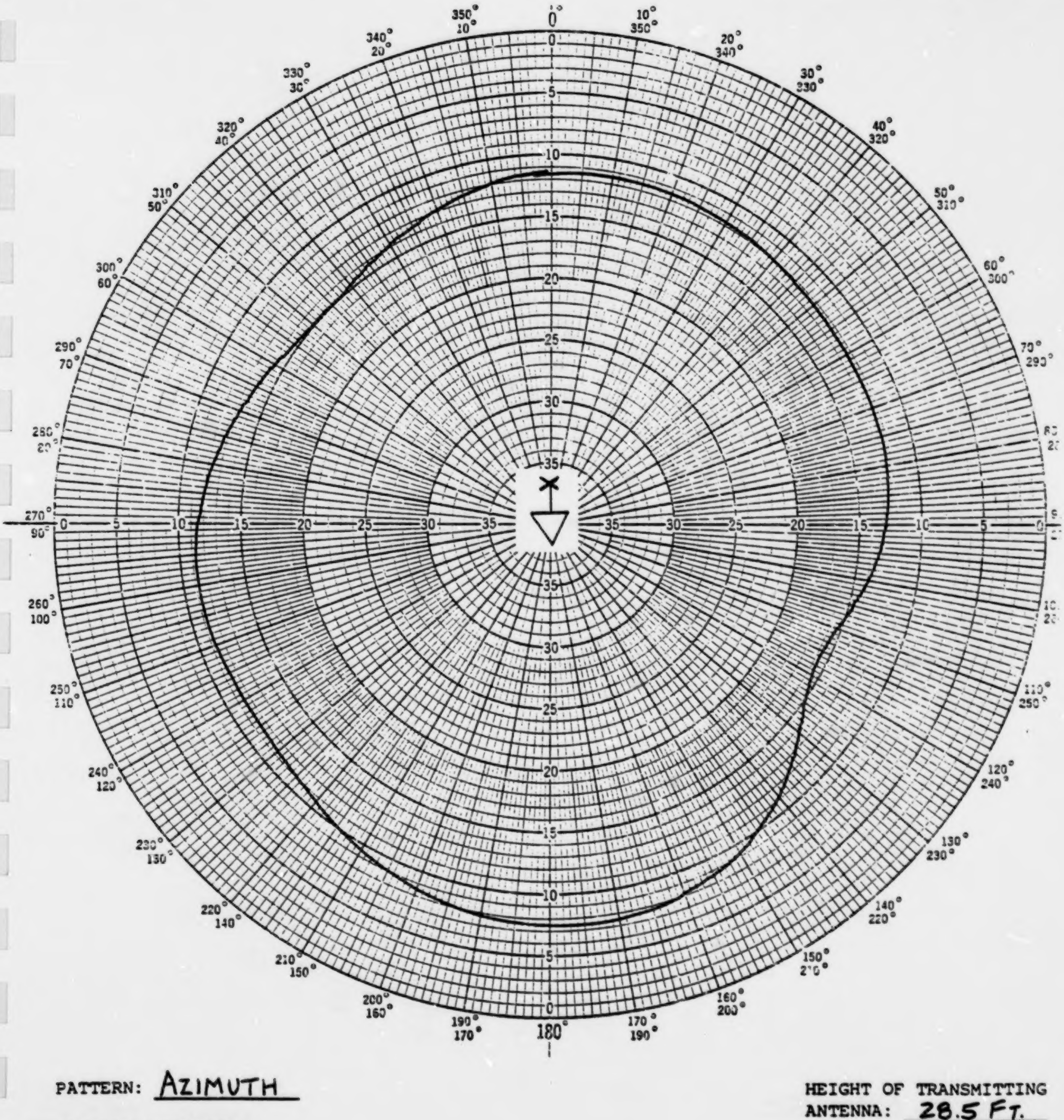
RING RADIUS: 38.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

PATTERN NO.: EF3



PATTERN: AZIMUTH

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: VERT.

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

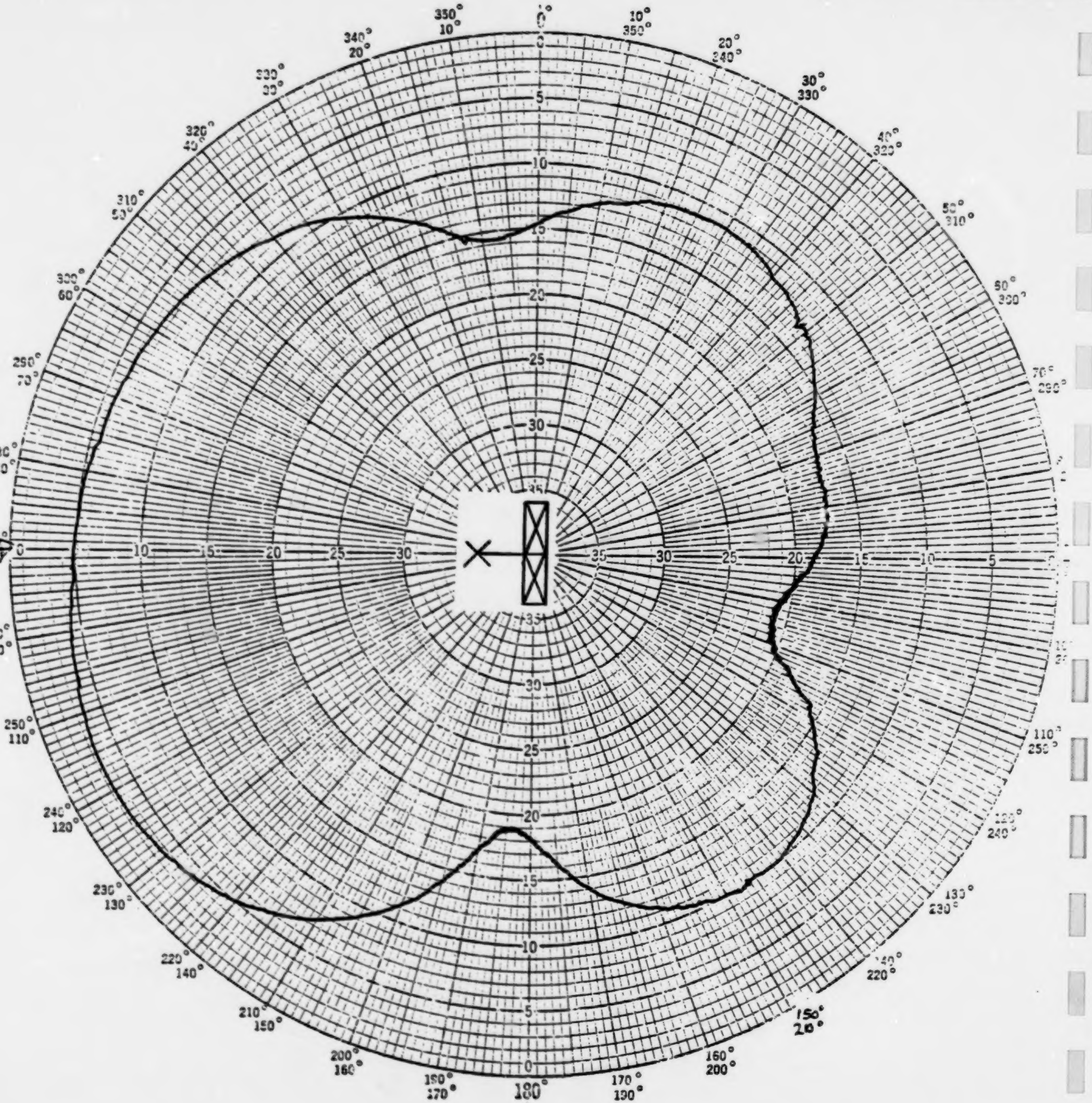
RING RADIUS: 38.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

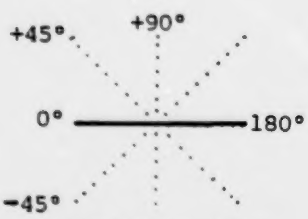
PATTERN NO.: EF4



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

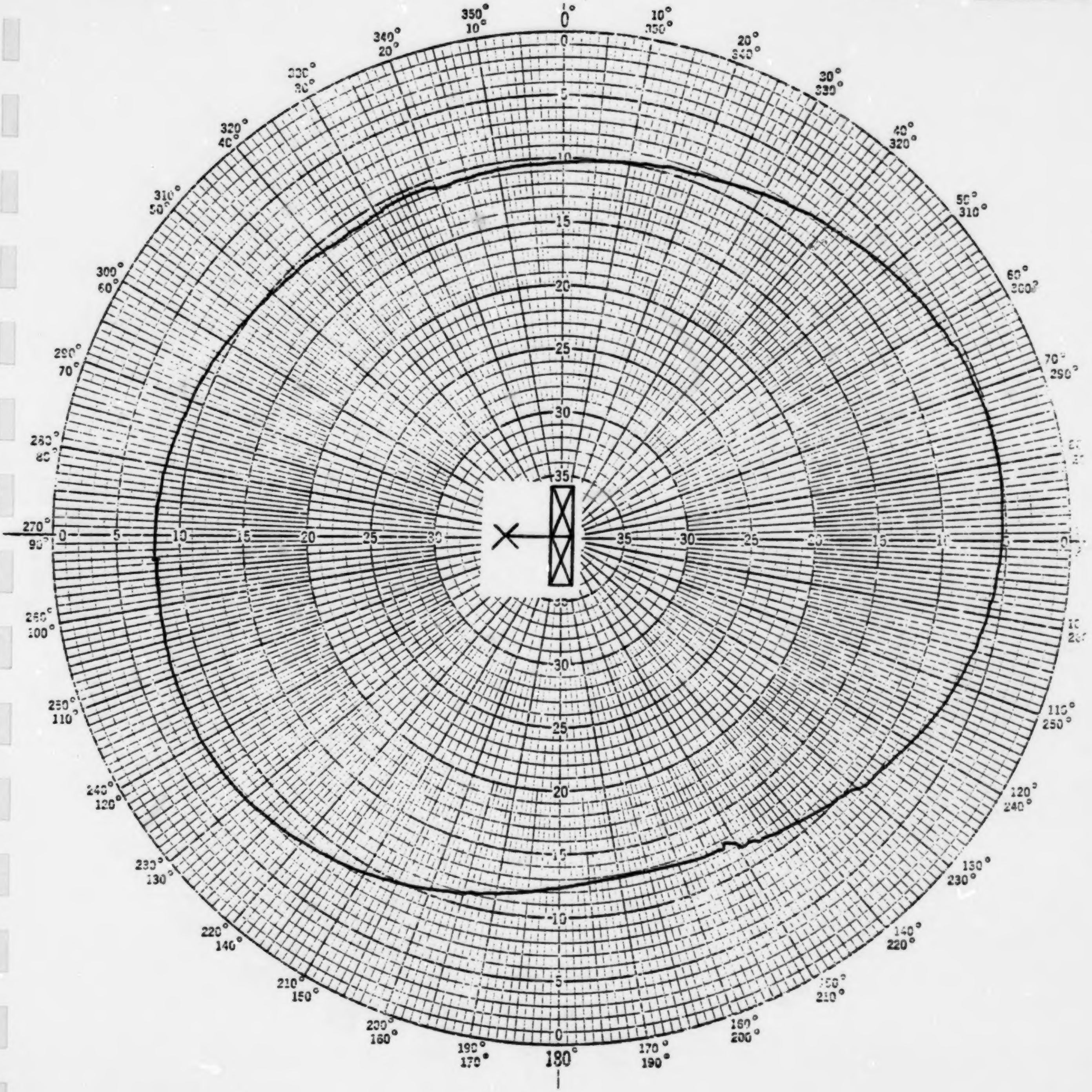
RING RADIUS: 38.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

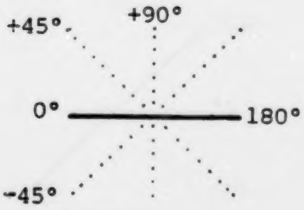
PATTERN NO.: EF5



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

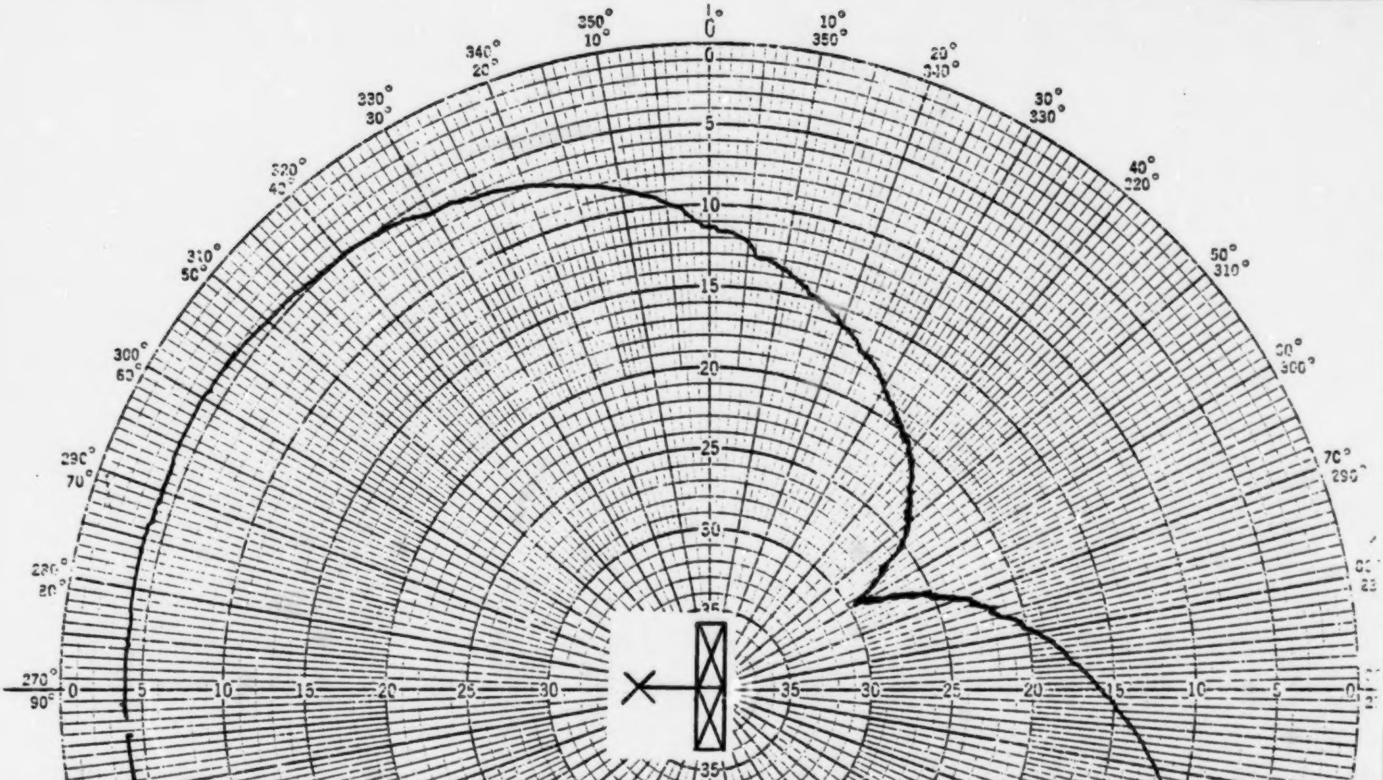
RING RADIUS: 38.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

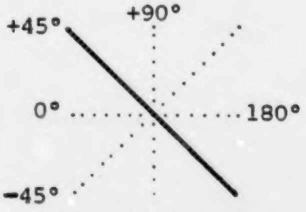
PATTERN NO.: EF6



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

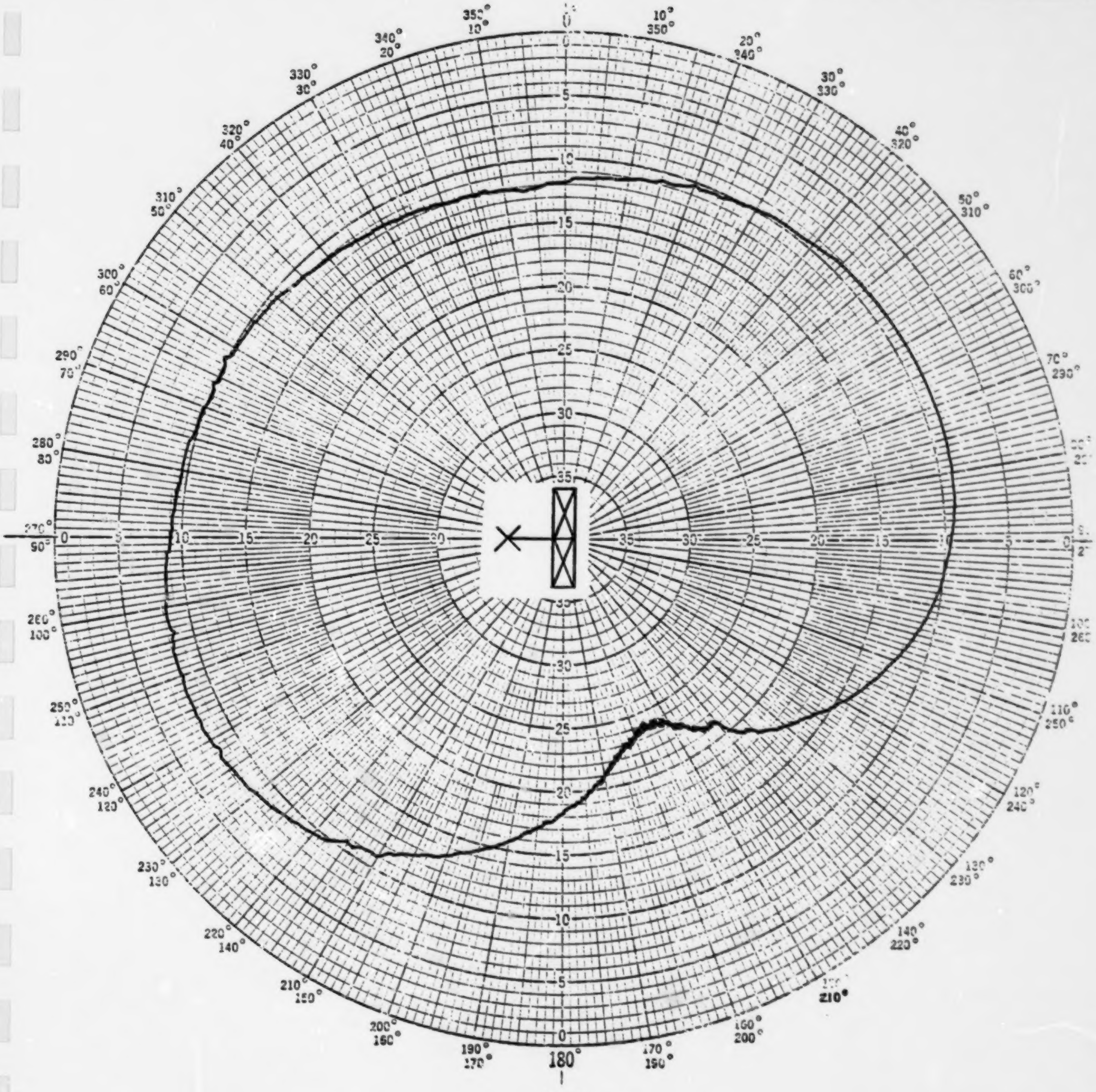
RING RADIUS: 38.5"

**MCi Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

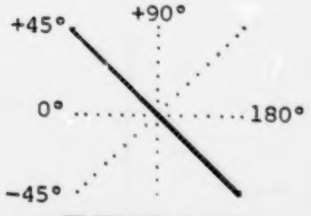
PATTERN NO.: EF7



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

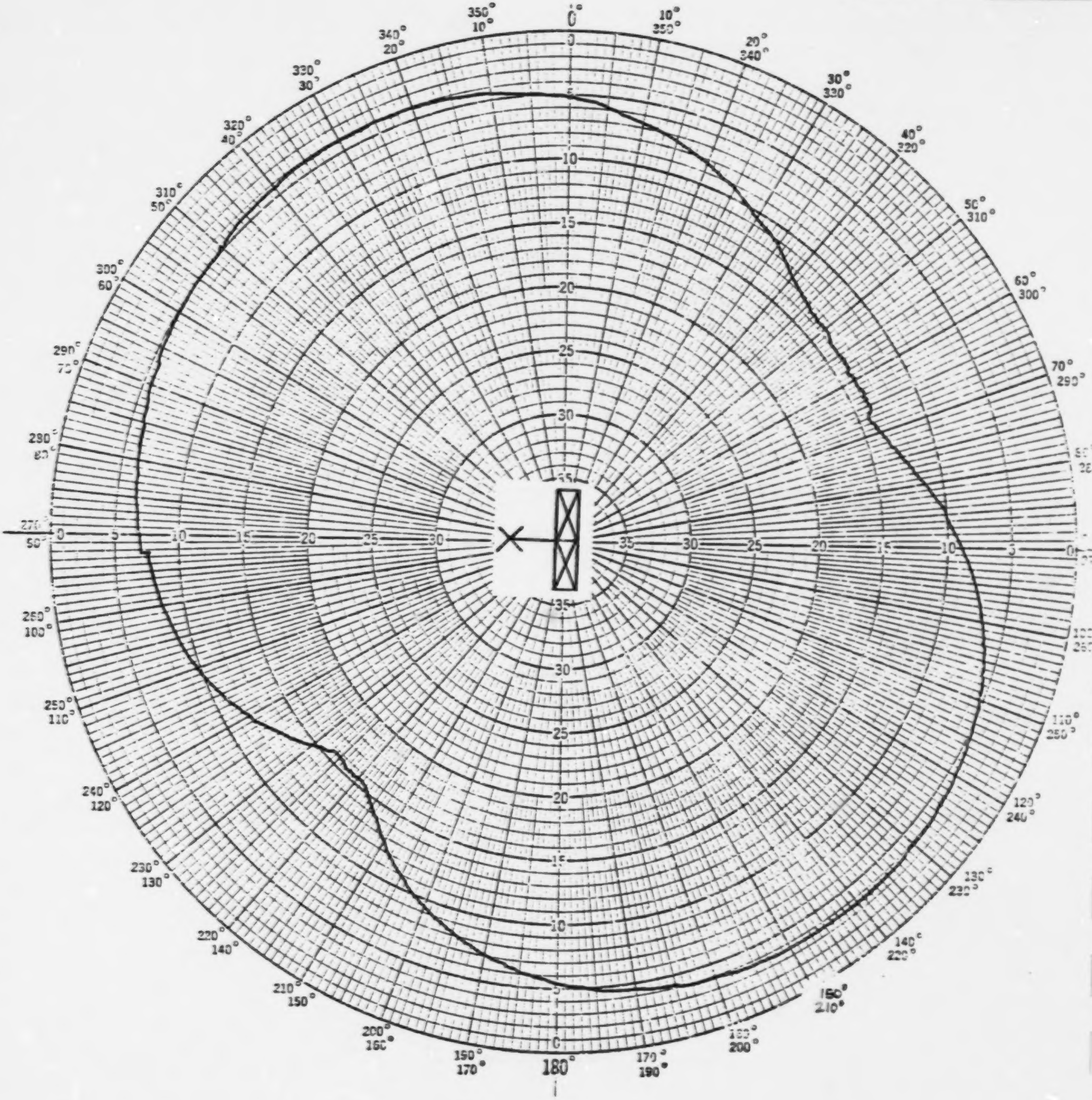
RING RADIUS: 38.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

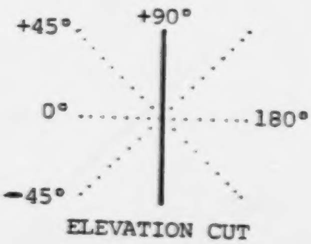
PATTERN NO.: EF8



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

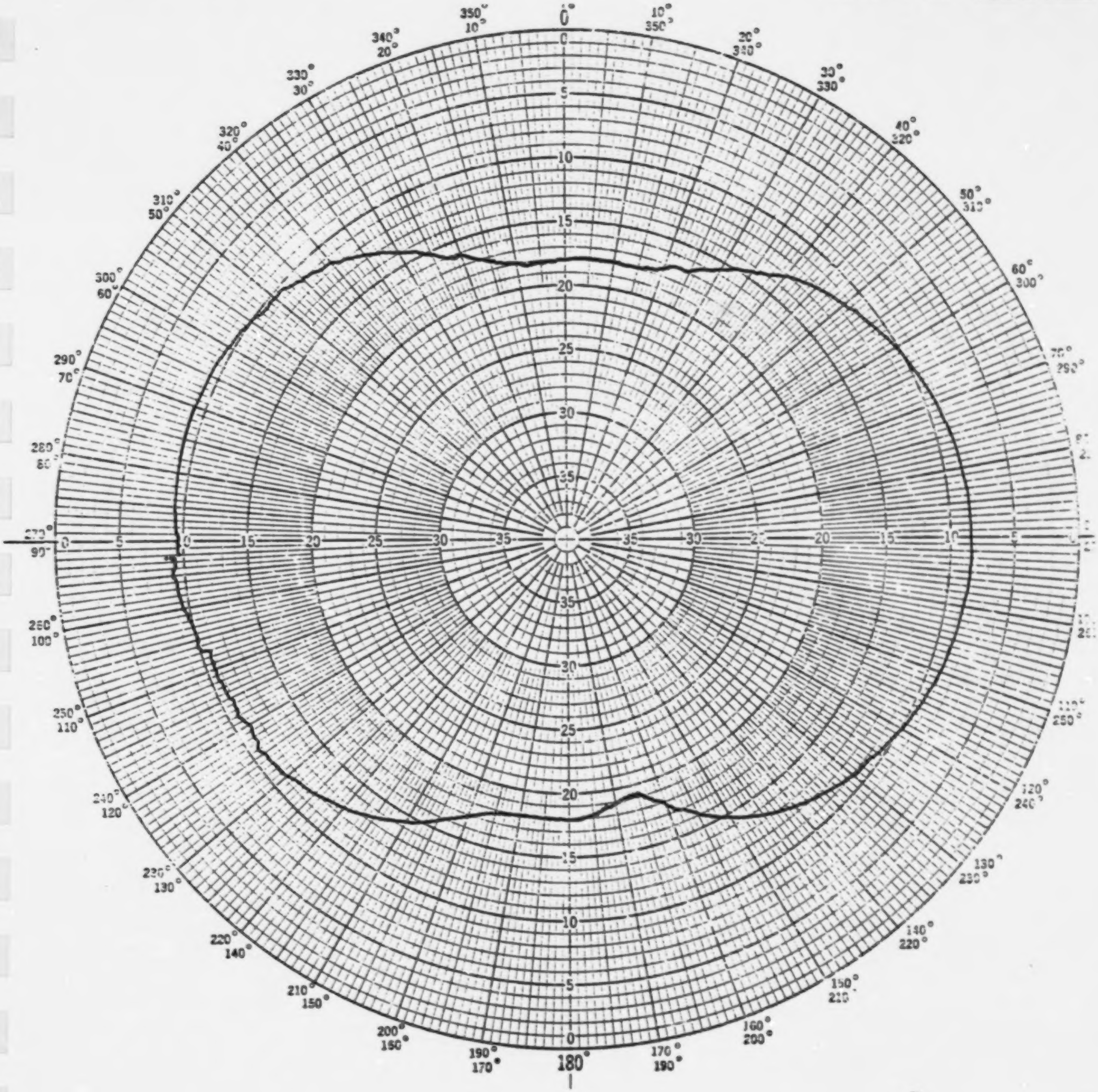
RING RADIUS: 38.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

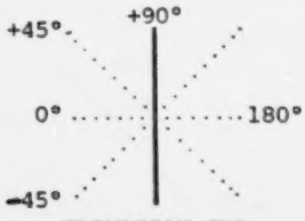
PATTERN NO.: EF9



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

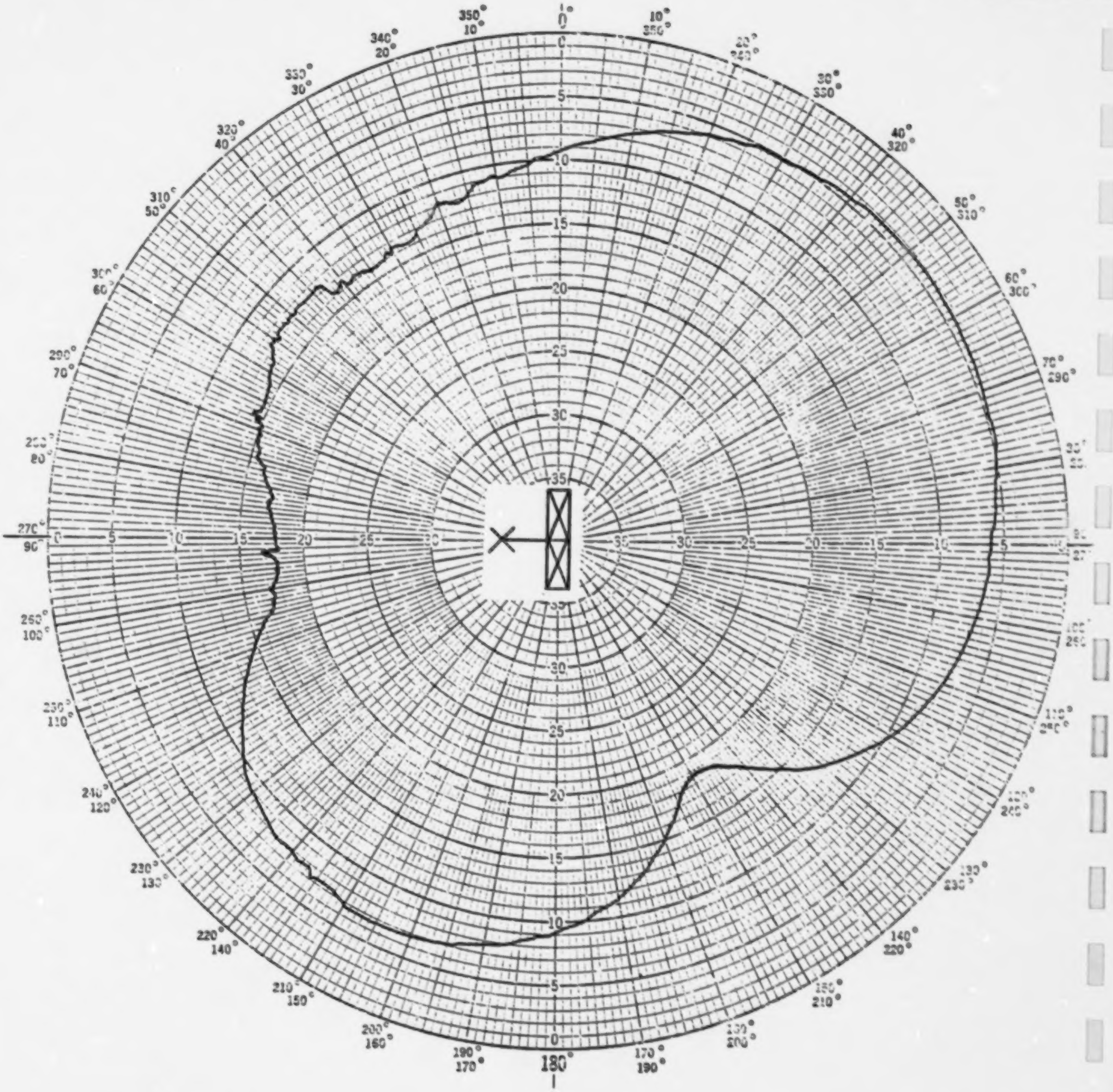
HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

RING RADIUS: 38.5"

**Micro Communications Inc.**

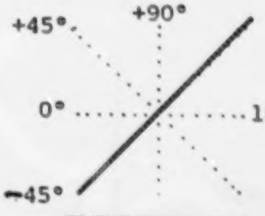
DATE: 7/27/81
MODEL: E
PATTERN NO.: EF10



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

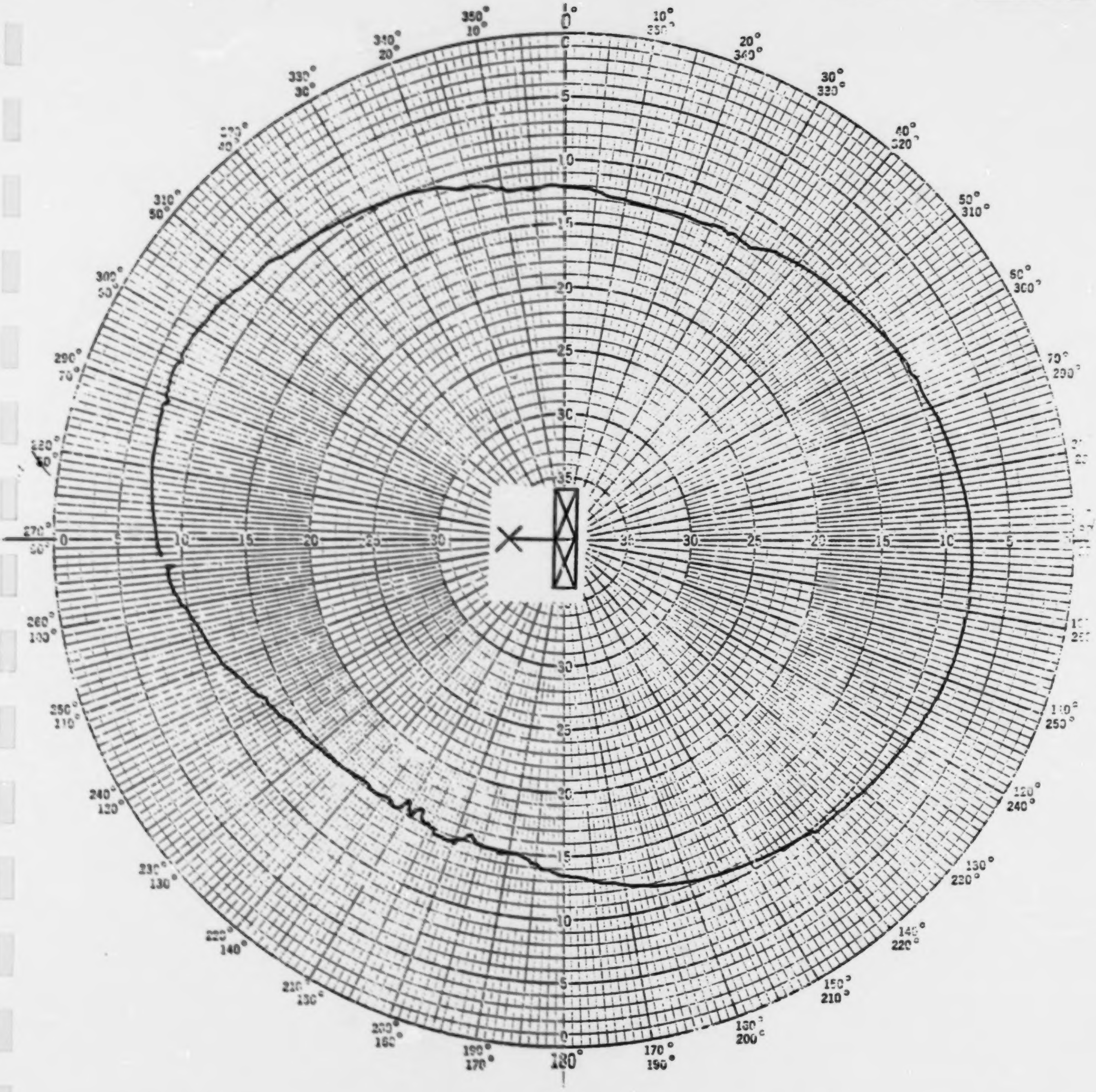
RING RADIUS: 38.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

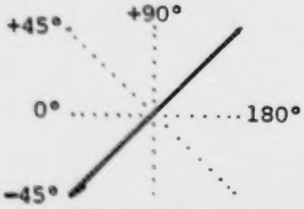
PATTERN NO.: EF11



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

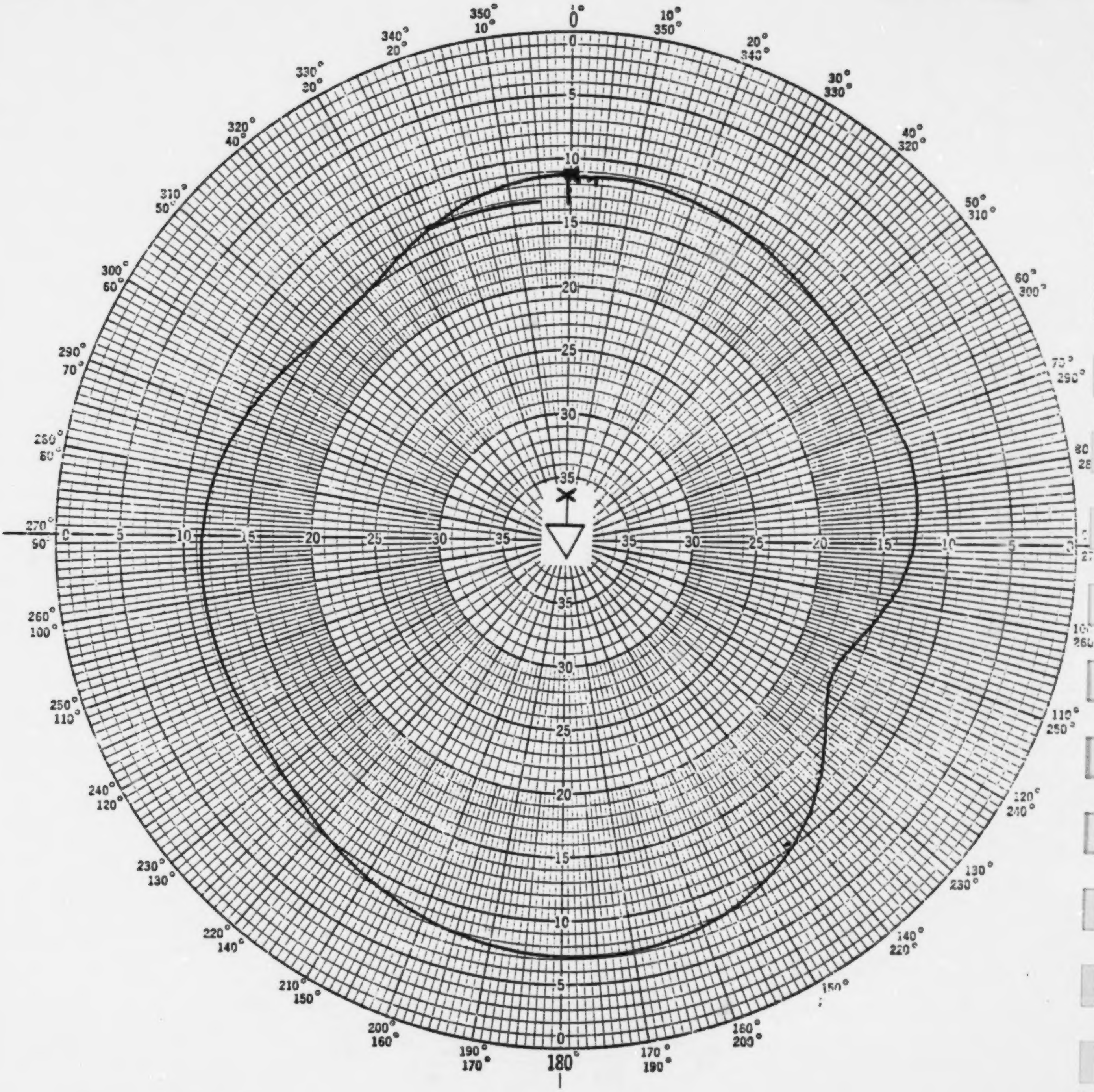
RING RADIUS: 38.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

PATTERN NO.: EF12



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

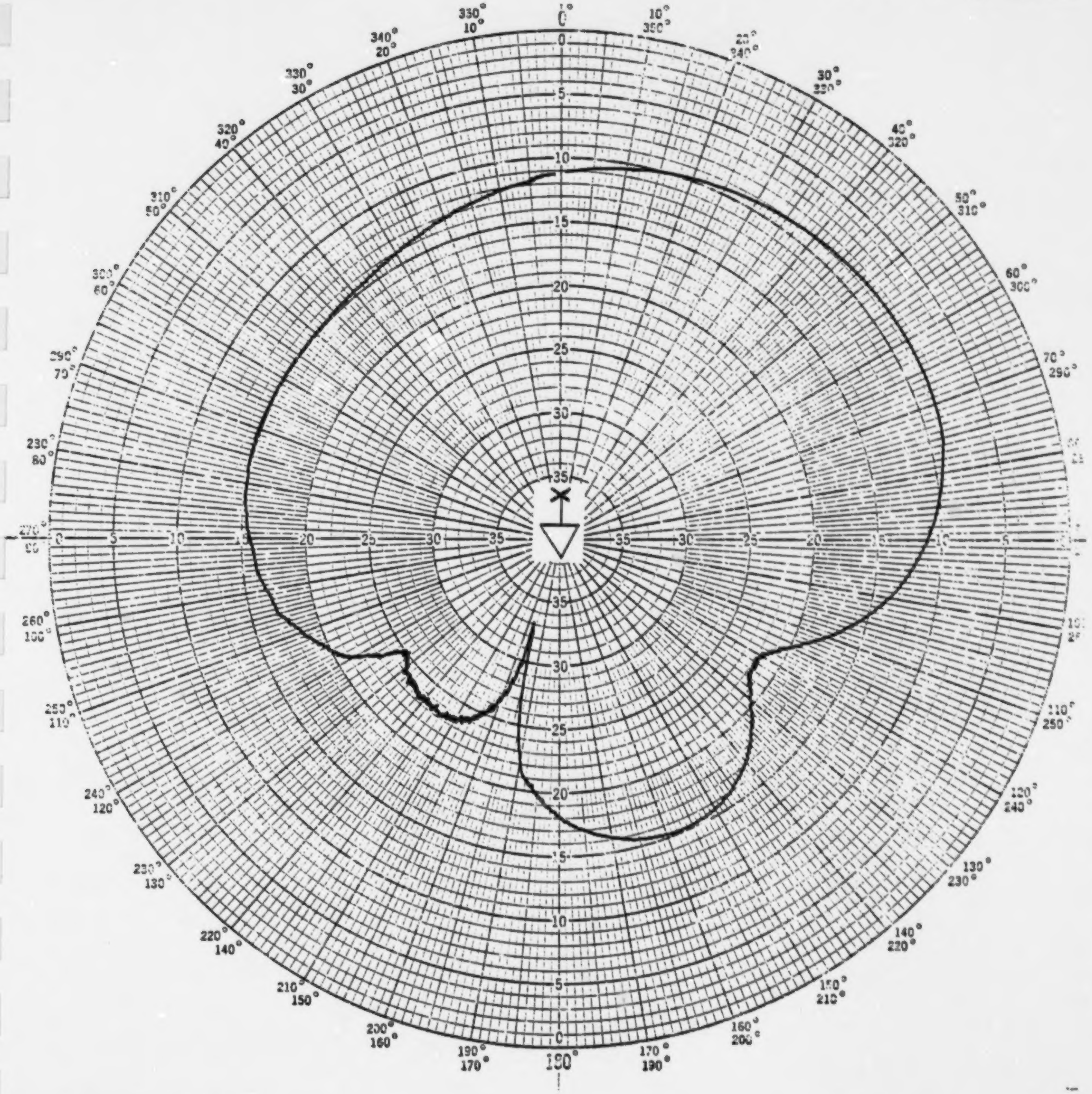
RING RADIUS: 38.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

PATTERN NO.: EF13



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

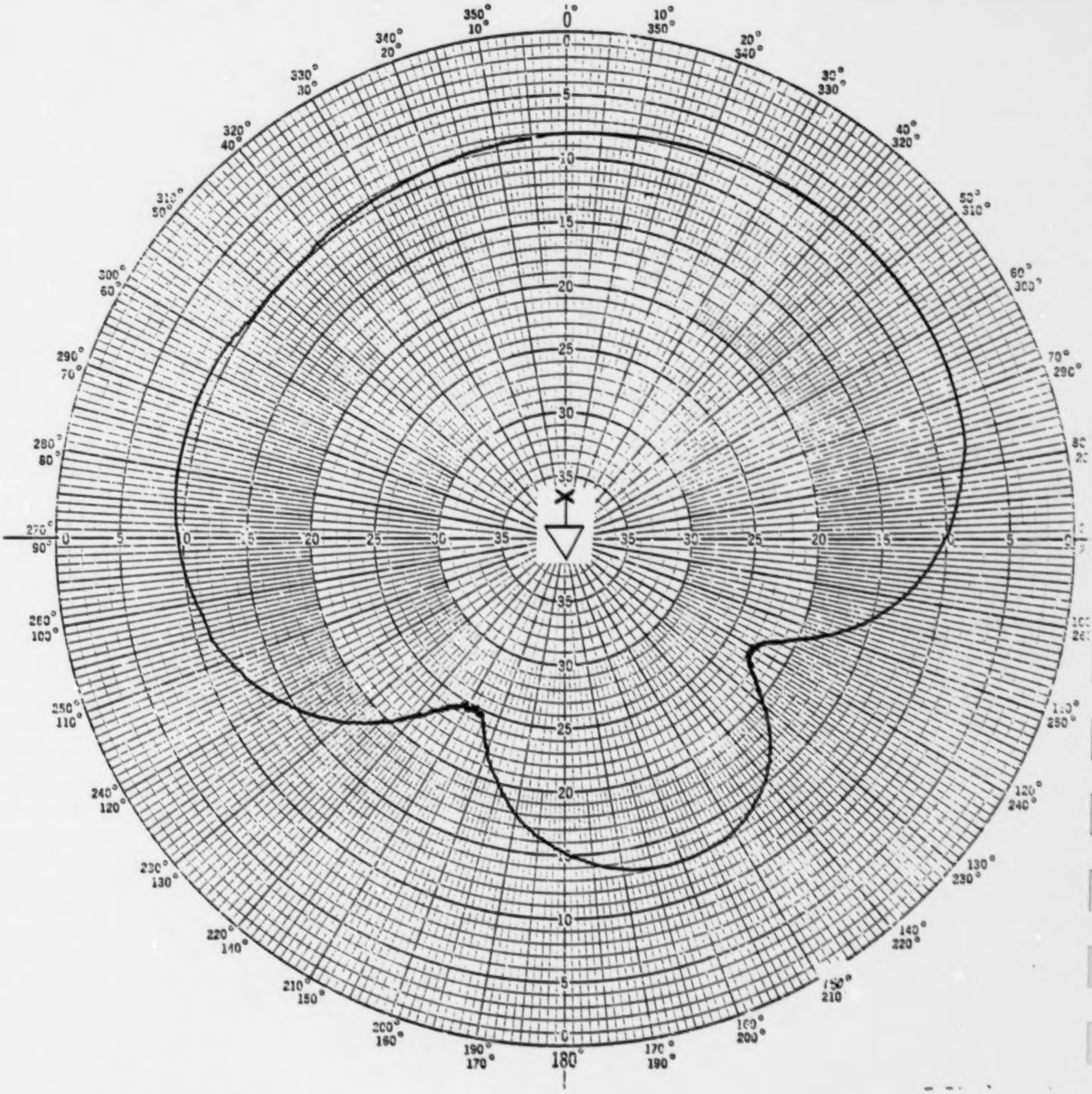
RING RADIUS: 38.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

PATTERN NO.: EF14



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

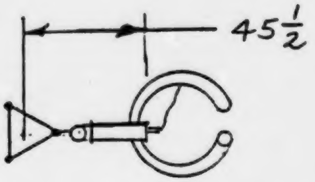
DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

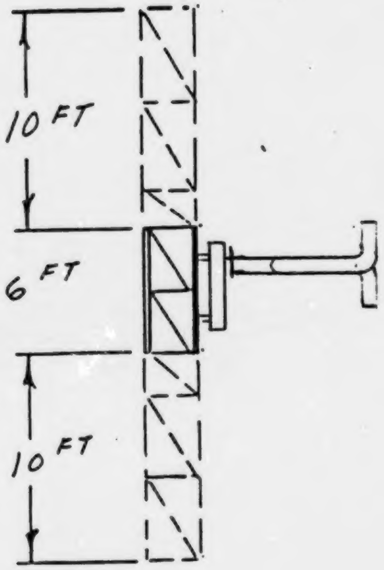
RING RADIUS: 38.5"

## MODEL "E"
## ANTENNA MOUNTED
## ON TOWER LEG
July 27, 1981

| PATTERN NUMBER * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | TRANS. ANTENNA POLAR-IZATION | REMARKS |
|---|---|---|---|---|
| EL1 (220) | 28.5 | Azimuth | Hoz. | |
| EL2 (221) | 28.5 | Azimuth | Vert. | |
| EL3 (222) | 28.5 | Elevation | Hoz. | 0-180 cut |
| EL4 (223) | 28.5 | Elevation | Vert. | 0-180 cut |
| EL5 (224) | 28.5 | Elevation | Hoz. | +45 cut |
| EL6 (225) | 28.5 | Elevation | Vert. | +45 cut |
| EL7 (226) | 28.5 | Elevation | Hoz. | +90 cut |
| EL8 (227) | 28.5 | Elevation | Vert. | +90 cut |
| EL9 (228) | 28.5 | Elevation | Hoz. | -45 cut |
| EL10 (229) | 28.5 | Elevation | Vert. | -45 cut |
| EL11 (230) | 28.5 | Elevation | Hoz. | 0-108, Tower Extended to 16' |
| EL12 (231) | 28.5 | Elevation | Hoz. | 0-108, Tower Extended to 26' |

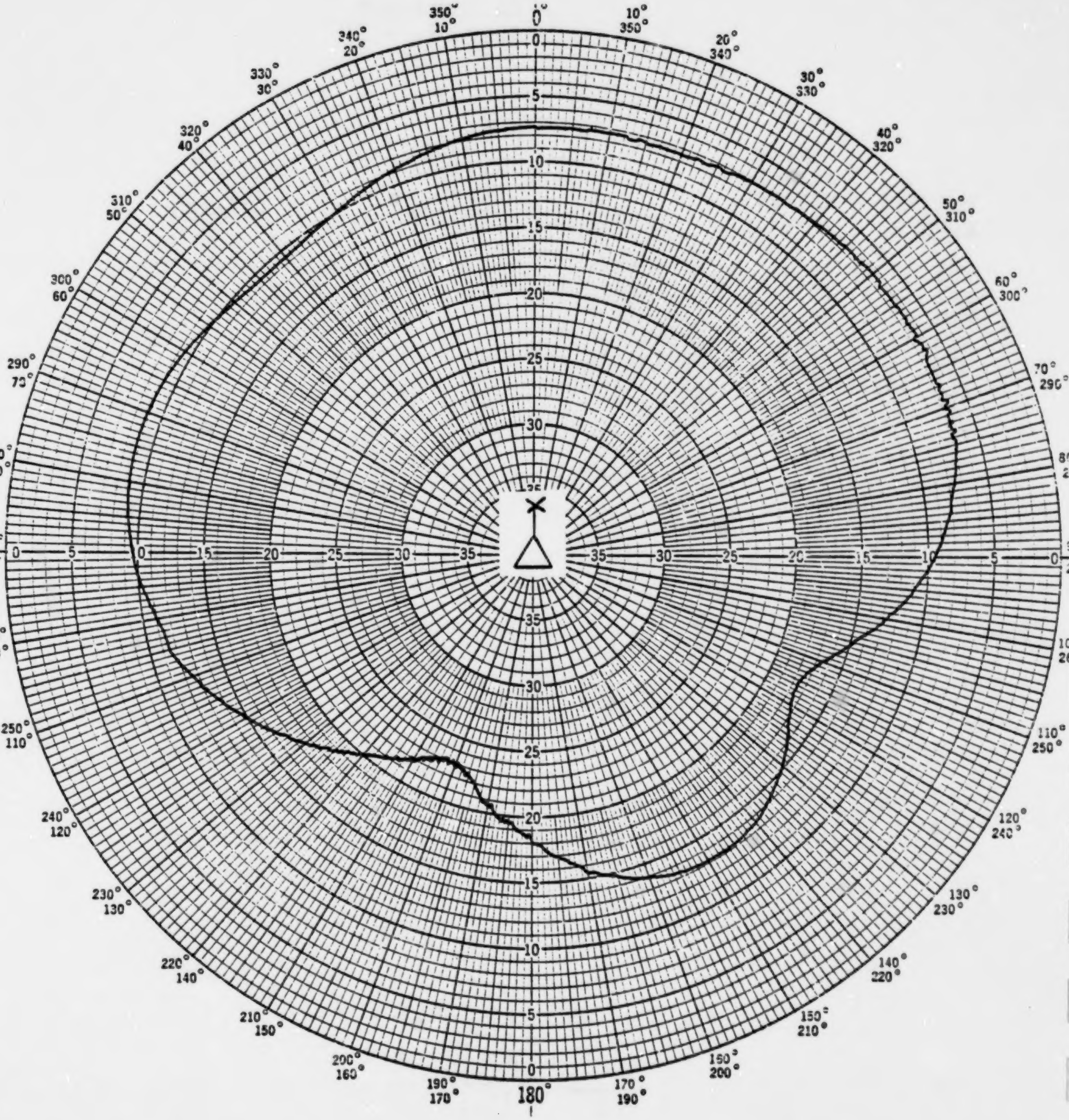
*Page Numbers





**Micro Communications Inc.**

DATE: 7/27/81
MODEL: E
PATTERN NO.: EL1



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: Hoz.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT

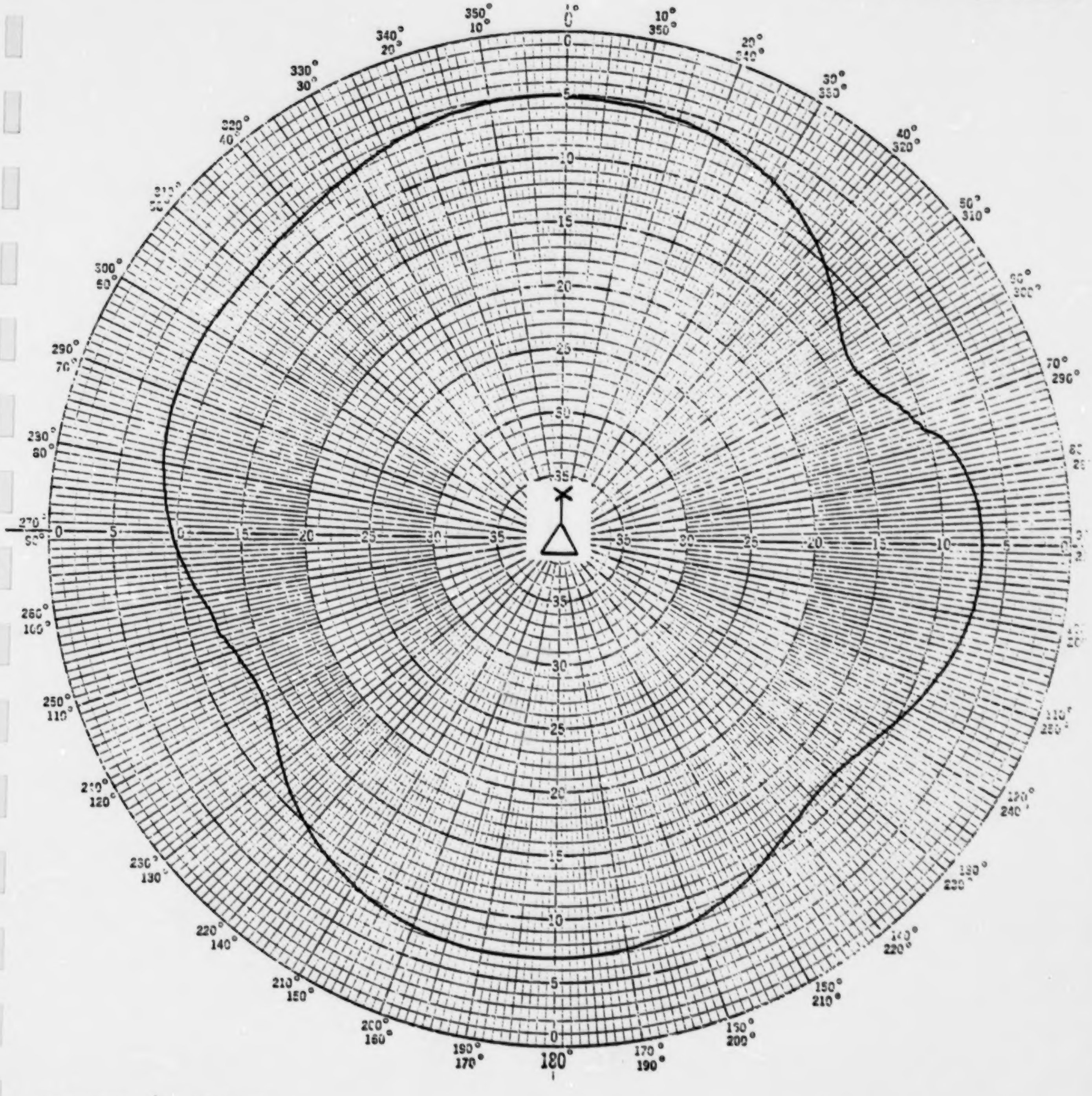
RING RADIUS: 44.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

PATTERN NO.: EL2



PATTERN: AZIMUTH

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

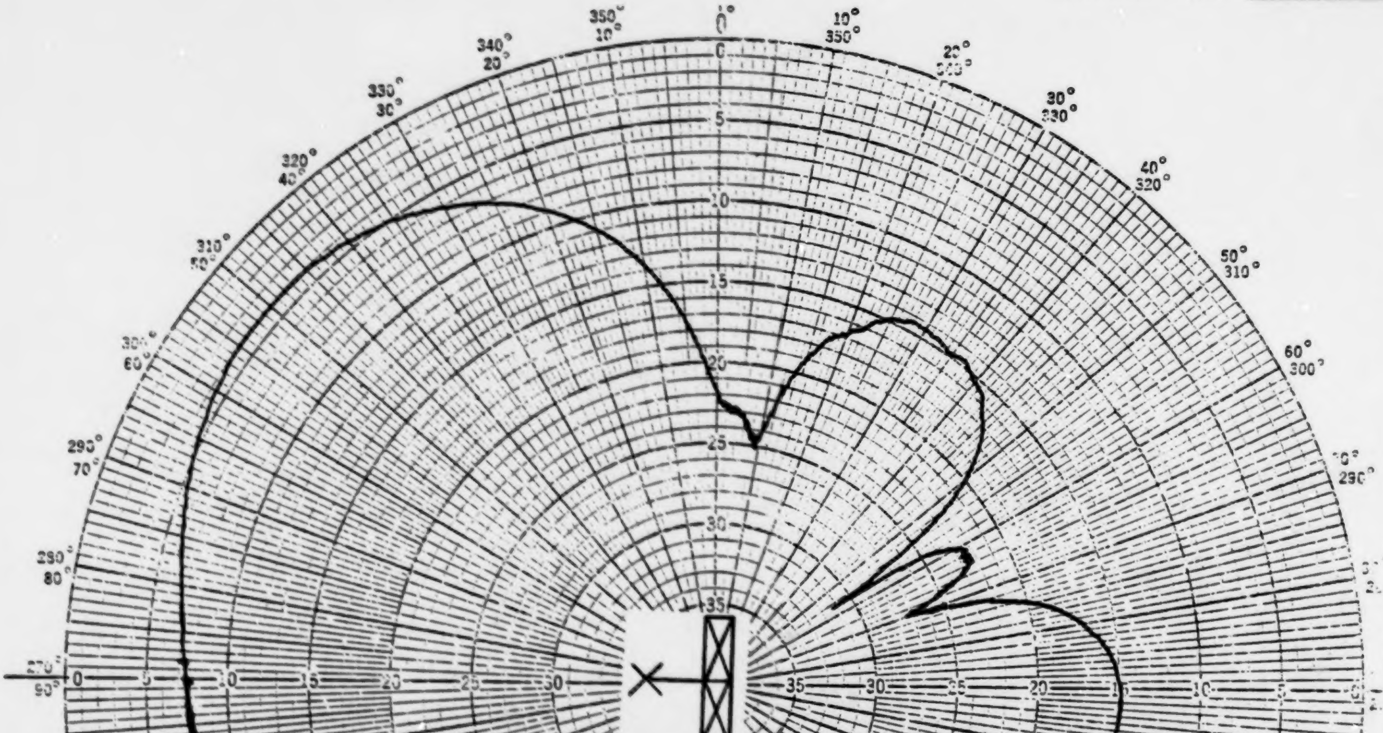
RING RADIUS: 44.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

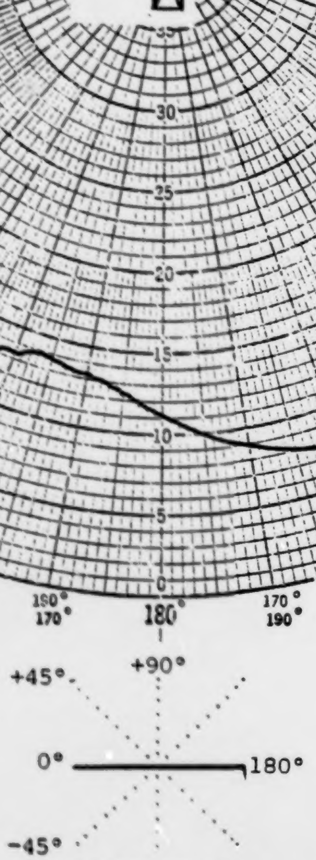
PATTERN NO.: EL3



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

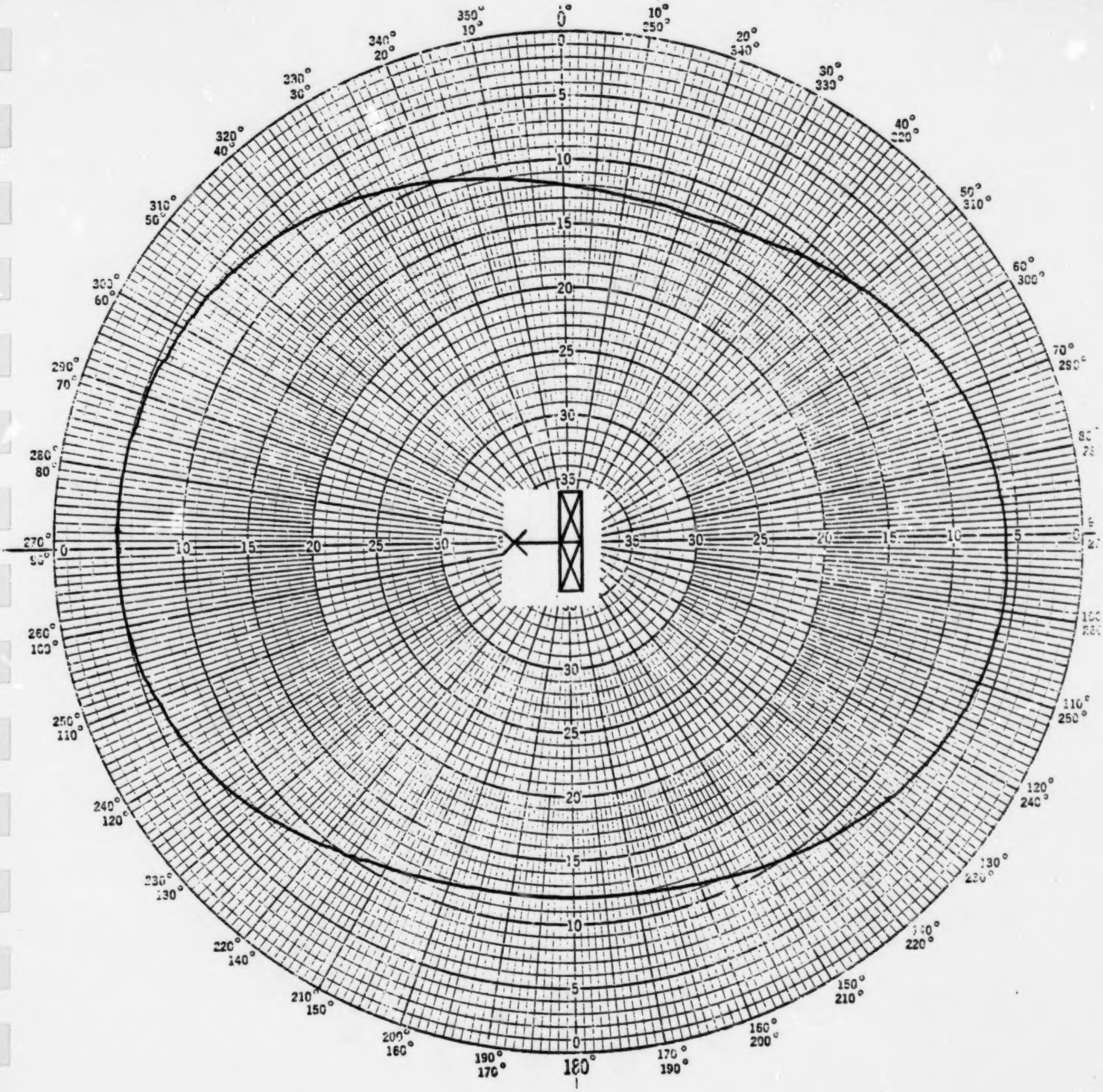
RING RADIUS: 44.5"

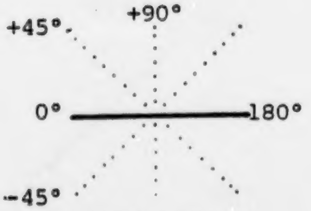
**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

PATTERN NO.: EL4





ELEVATION CUT

PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: VERT.

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

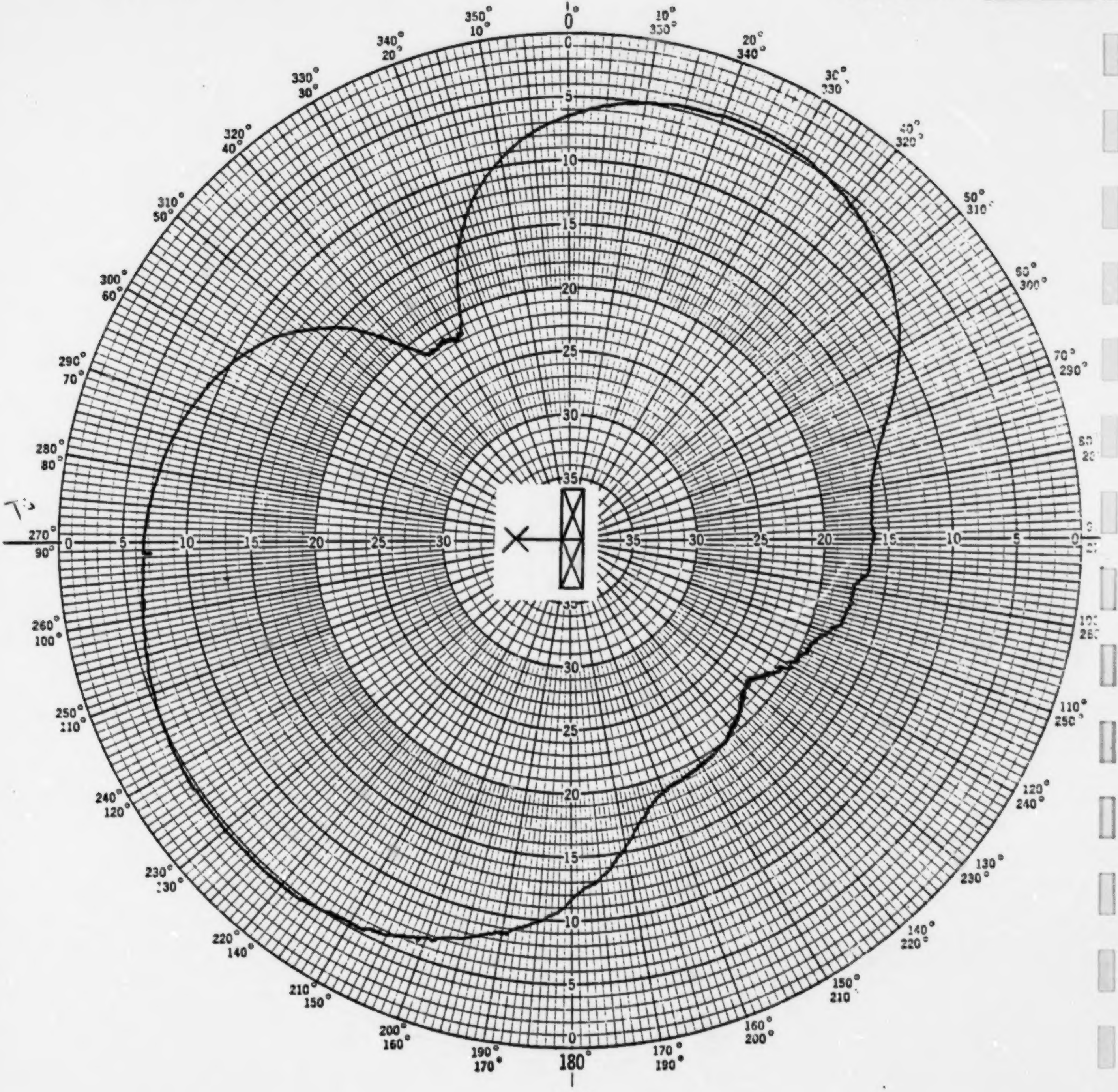
RING RADIUS: 44.5"

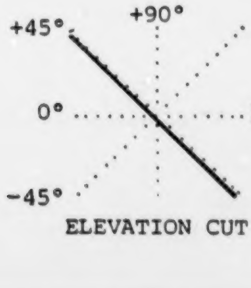
**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

PATTERN NO.: EL5





ELEVATION CUT

PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

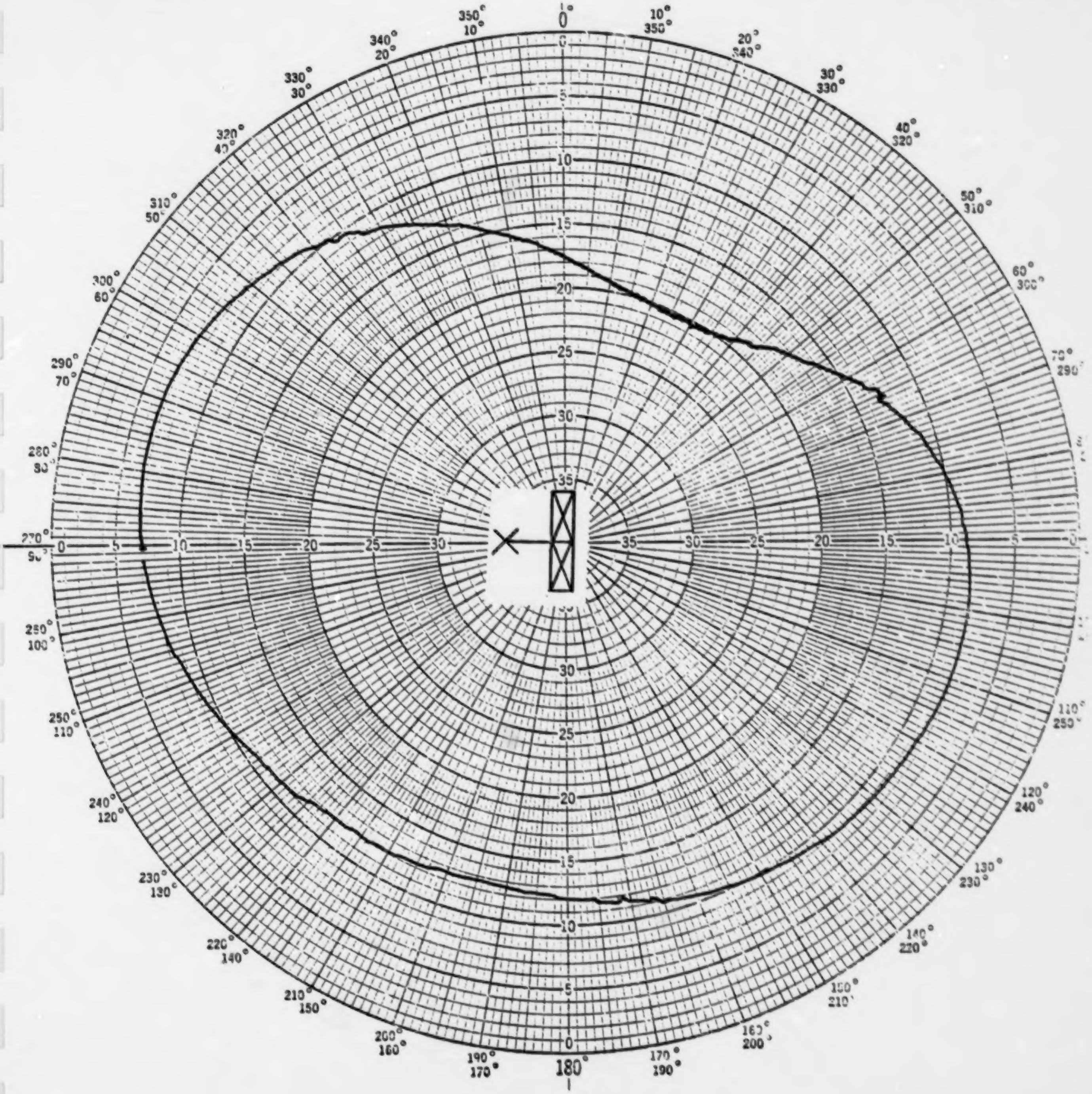
RING RADIUS: 44.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

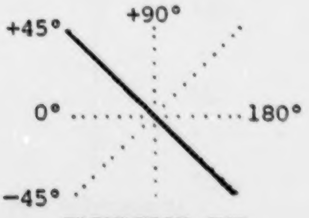
PATTERN NO.: EL6



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

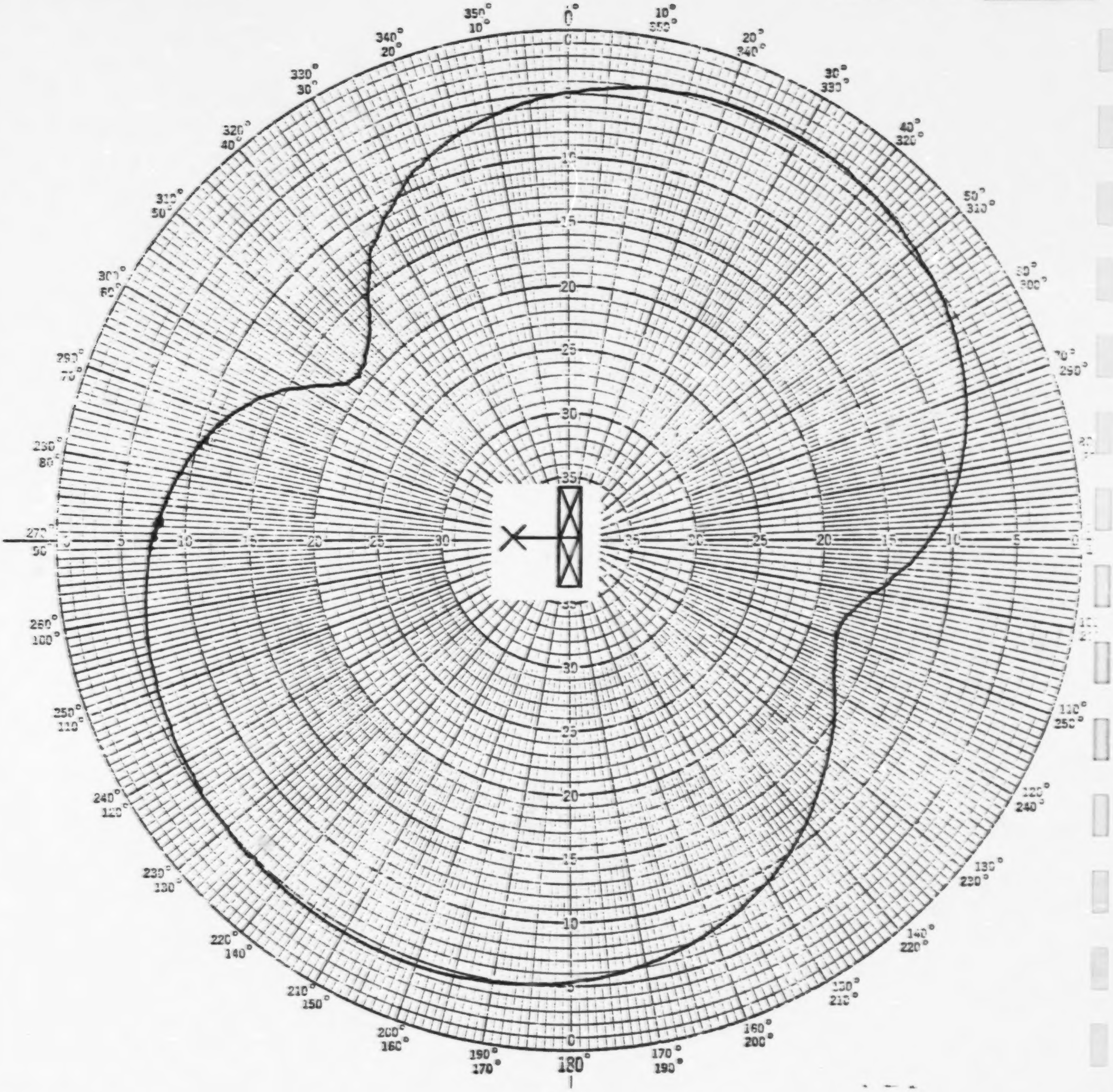
RING RADIUS: 44.5"

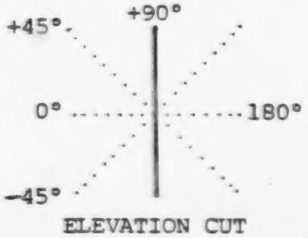
**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

PATTERN NO.: EL7





ELEVATION CUT

PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

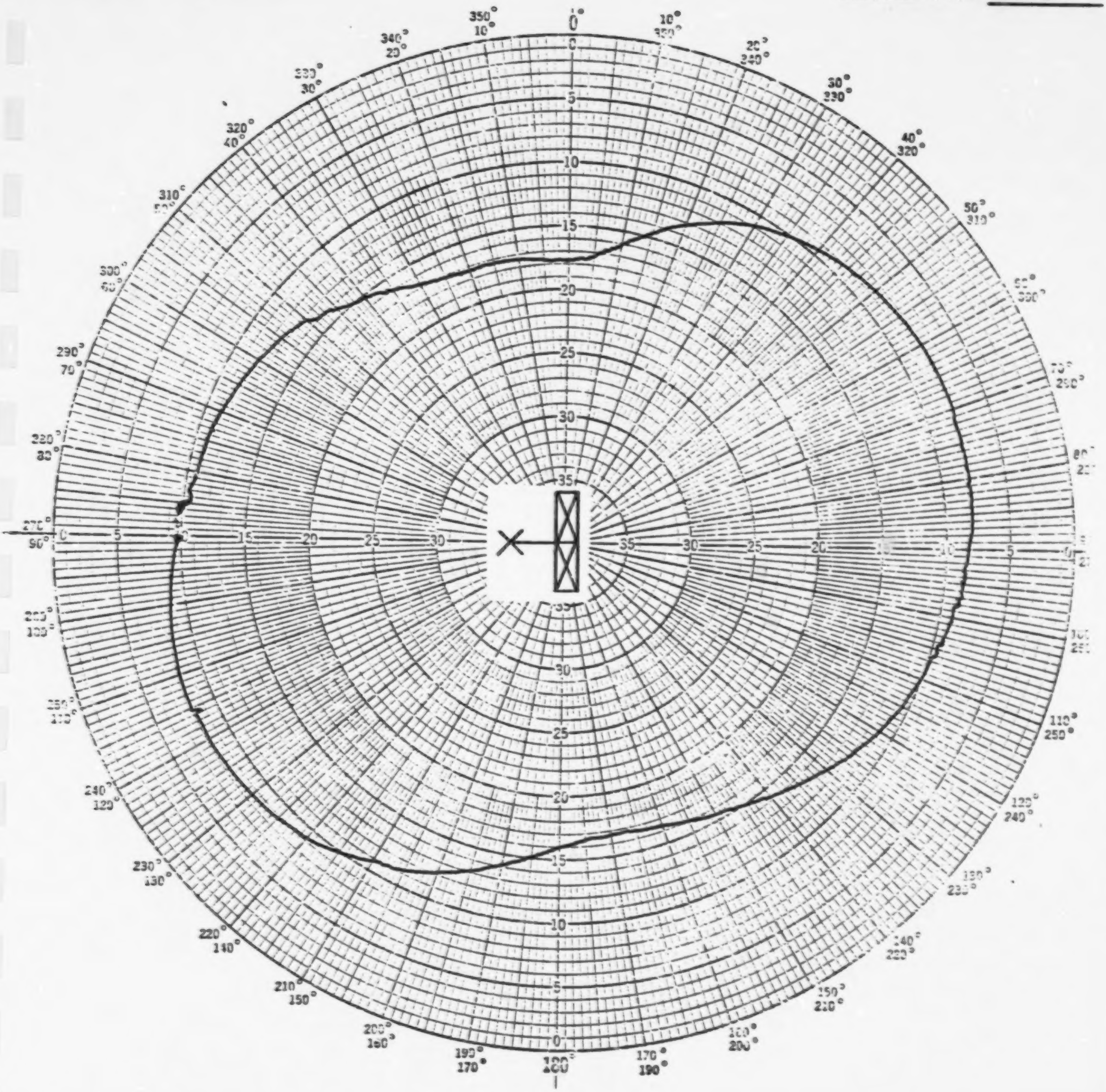
RING RADIUS: 44.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

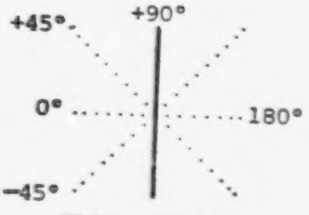
PATTERN NO.: EL8



PATTERN: ELEVATION

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

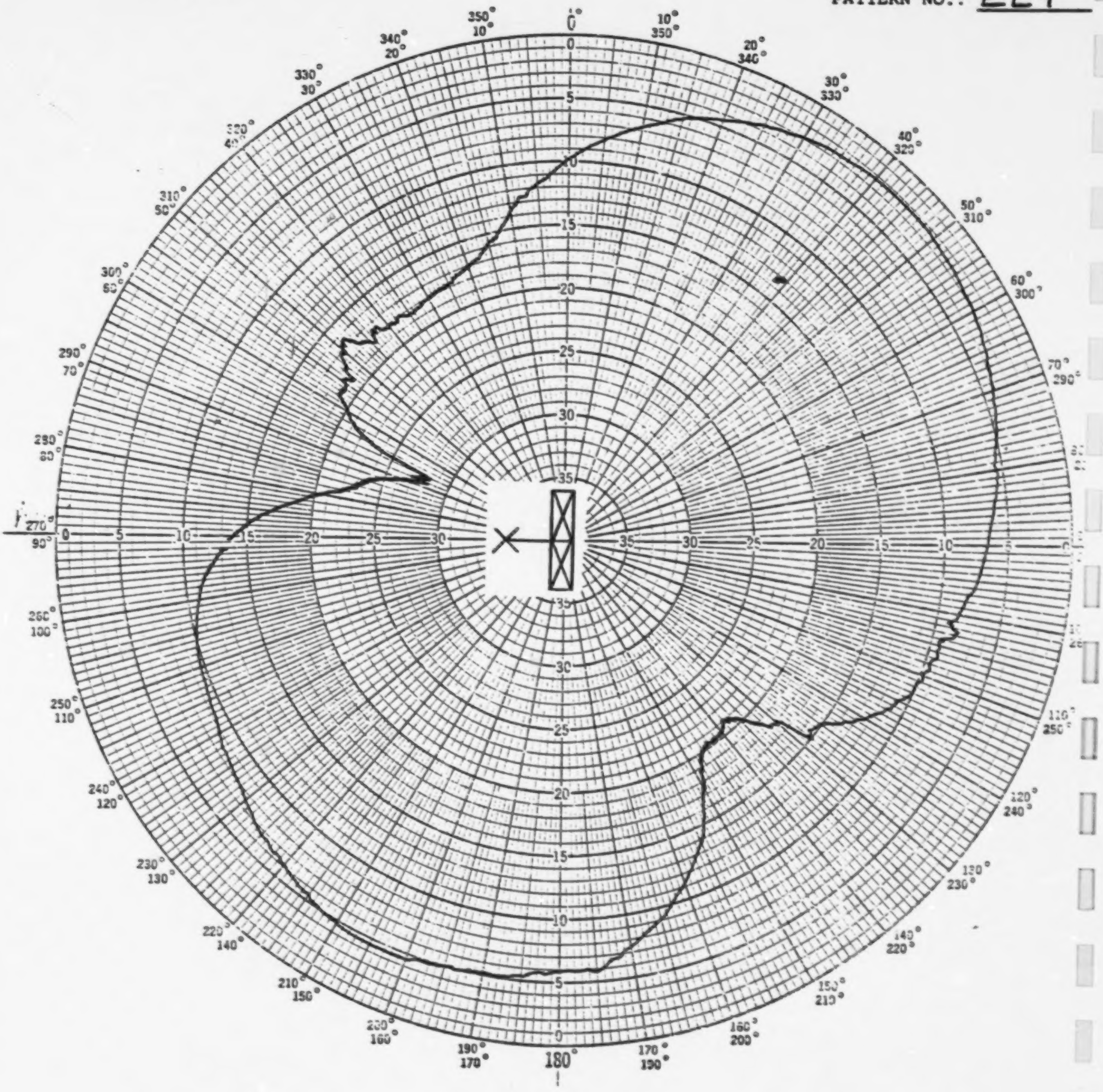
RING RADIUS: 44.5"

MCi Micro Communications Inc.

DATE: 7/27/81

MODEL: E

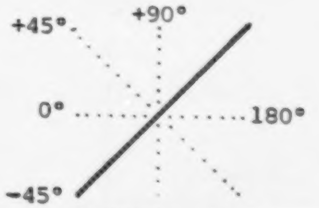
PATTERN NO.: EL9



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

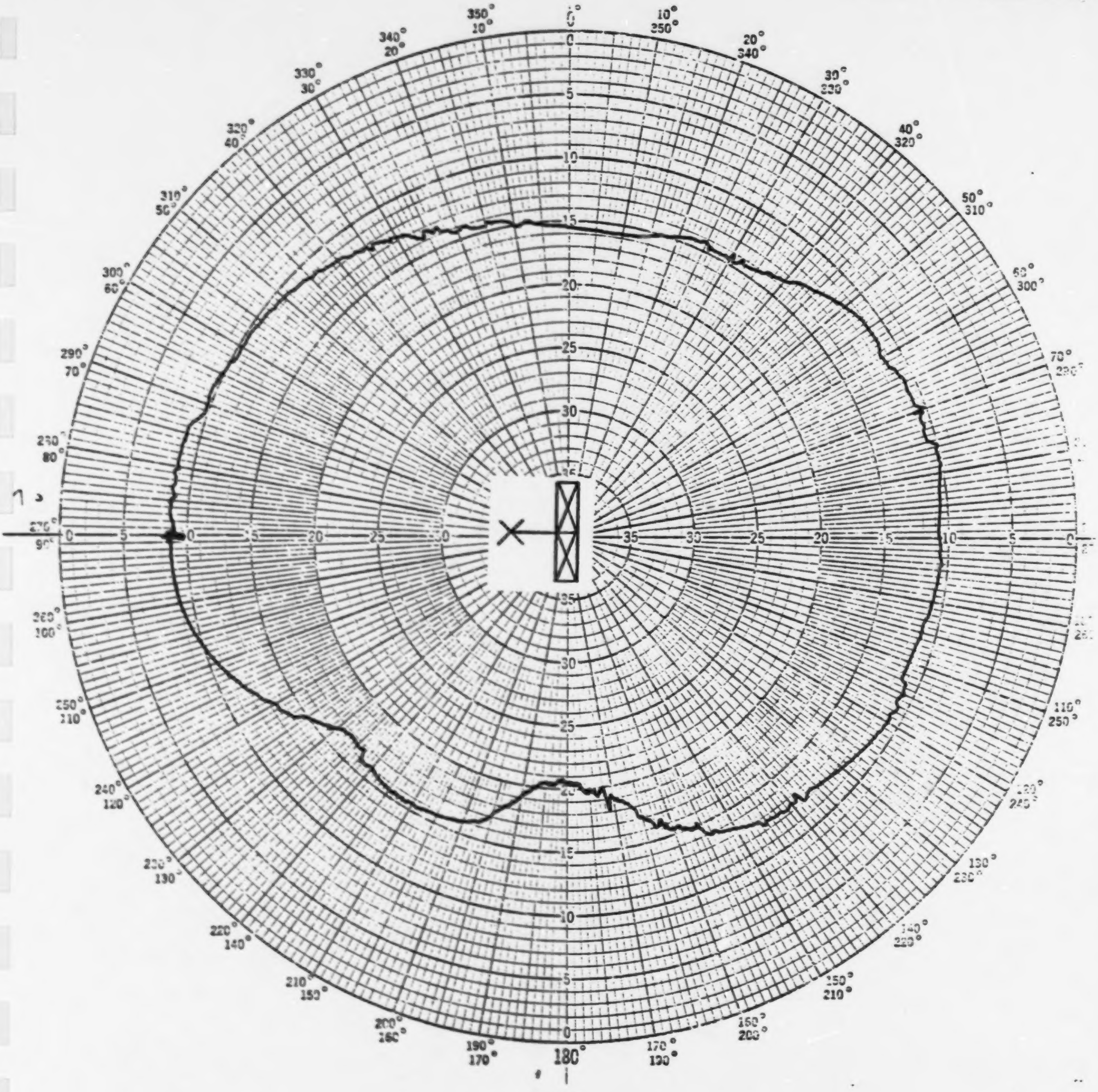
RING RADIUS: 44.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

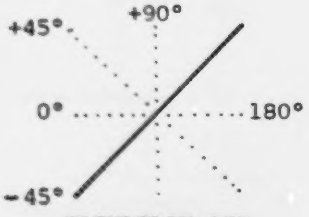
PATTERN NO.: EL10



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: VERT.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

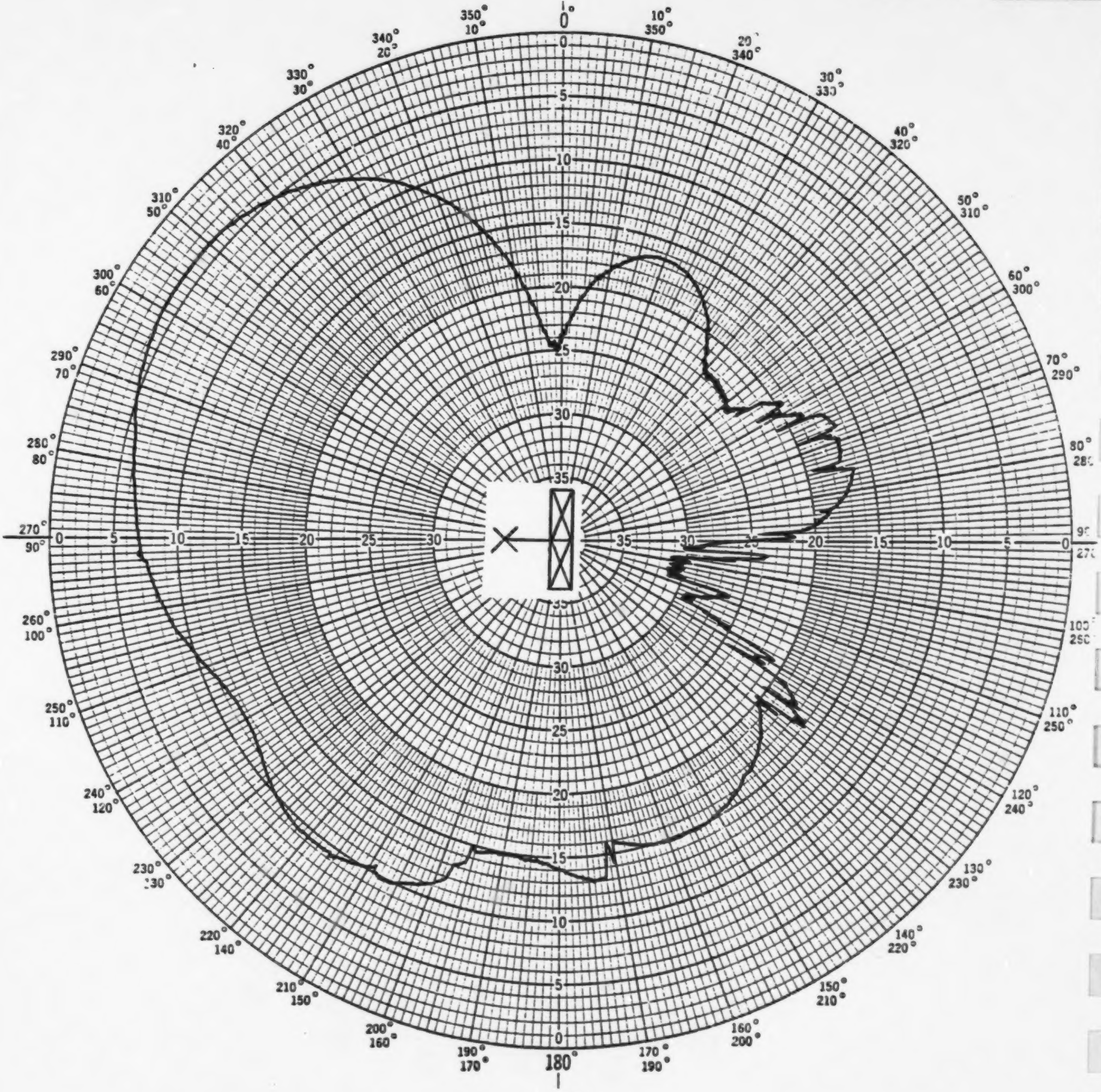
RING RADIUS: 44.5"

**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

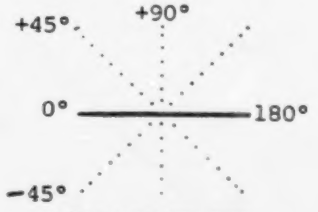
PATTERN NO.: EL11



PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.



ELEVATION CUT

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

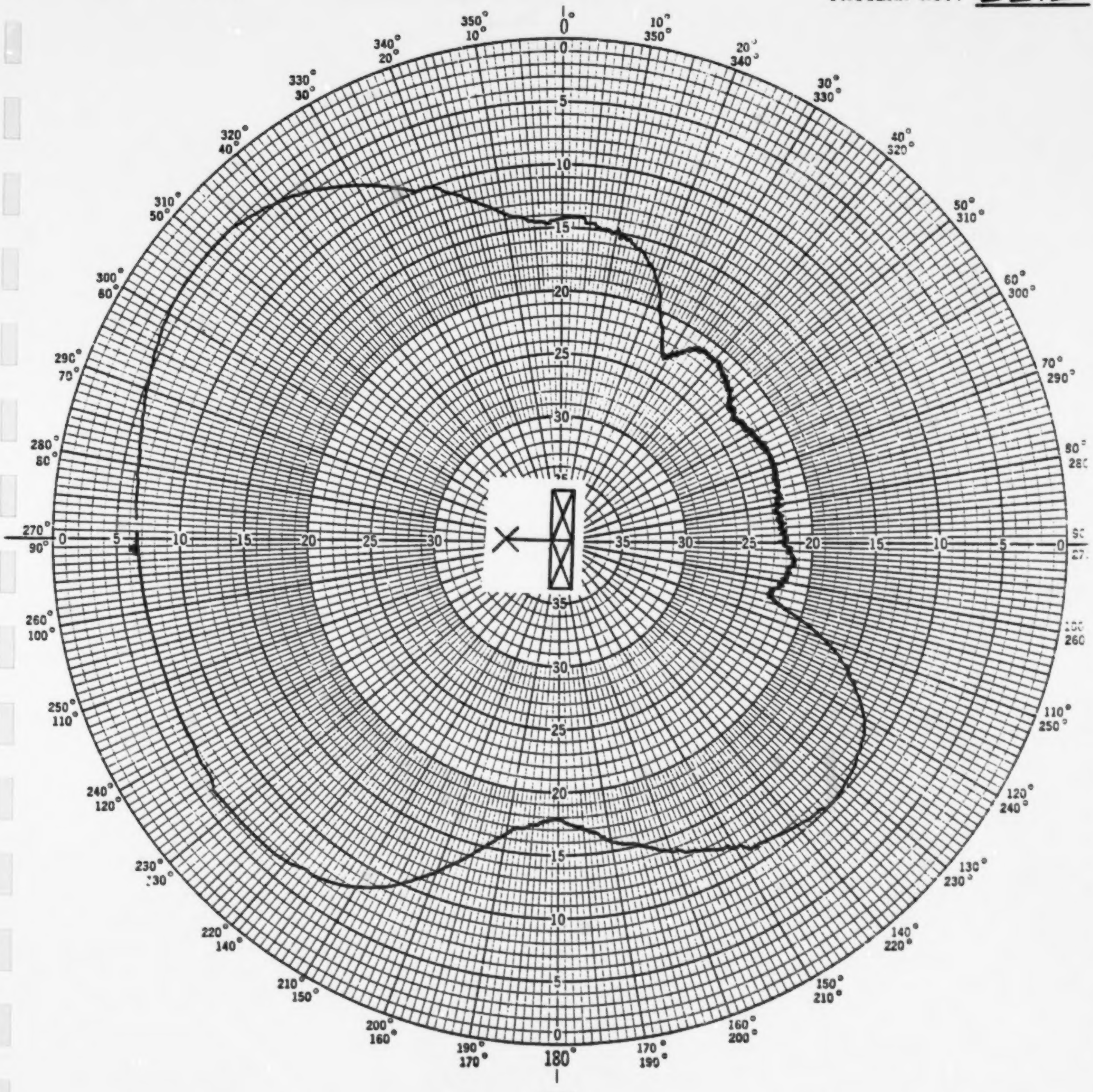
RING RADIUS: 44.5"

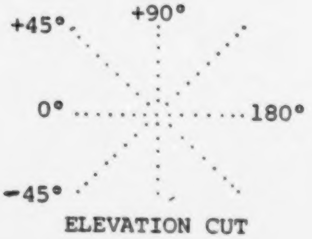
**Micro Communications Inc.**

DATE: 7/27/81

MODEL: E

PATTERN NO.: EL12





ELEVATION CUT

PATTERN: ELEVATION

ANTENNA LOCATION ON TOWER: LEG

TRANSMITTING ANTENNA POLARIZATION: Hoz.

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT

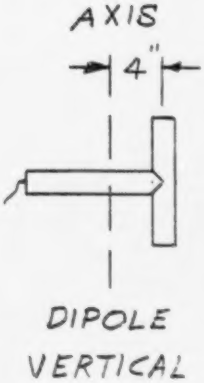
DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

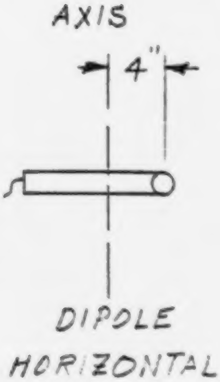
RING RADIUS: 44.5"

## MODEL "F"
## FREE SPACE MEASUREMENTS
Radius 4"
August 12, 1981

| PATTERN NUMBER | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | DIPOLE ORIENTATION | REMARKS |
|---|---|---|---|---|
| FFS1 (233)* | 28.5 | H-PLANE | HOZ. | |
| FFS2 (234) | 28.5 | E-PLANE | HOZ. | |
| FFS3 (235) | 19.0 | E/H-PLANE | HOZ. | |

*Page Numbers


AXIS
4"
DIPOLE
VERTICAL

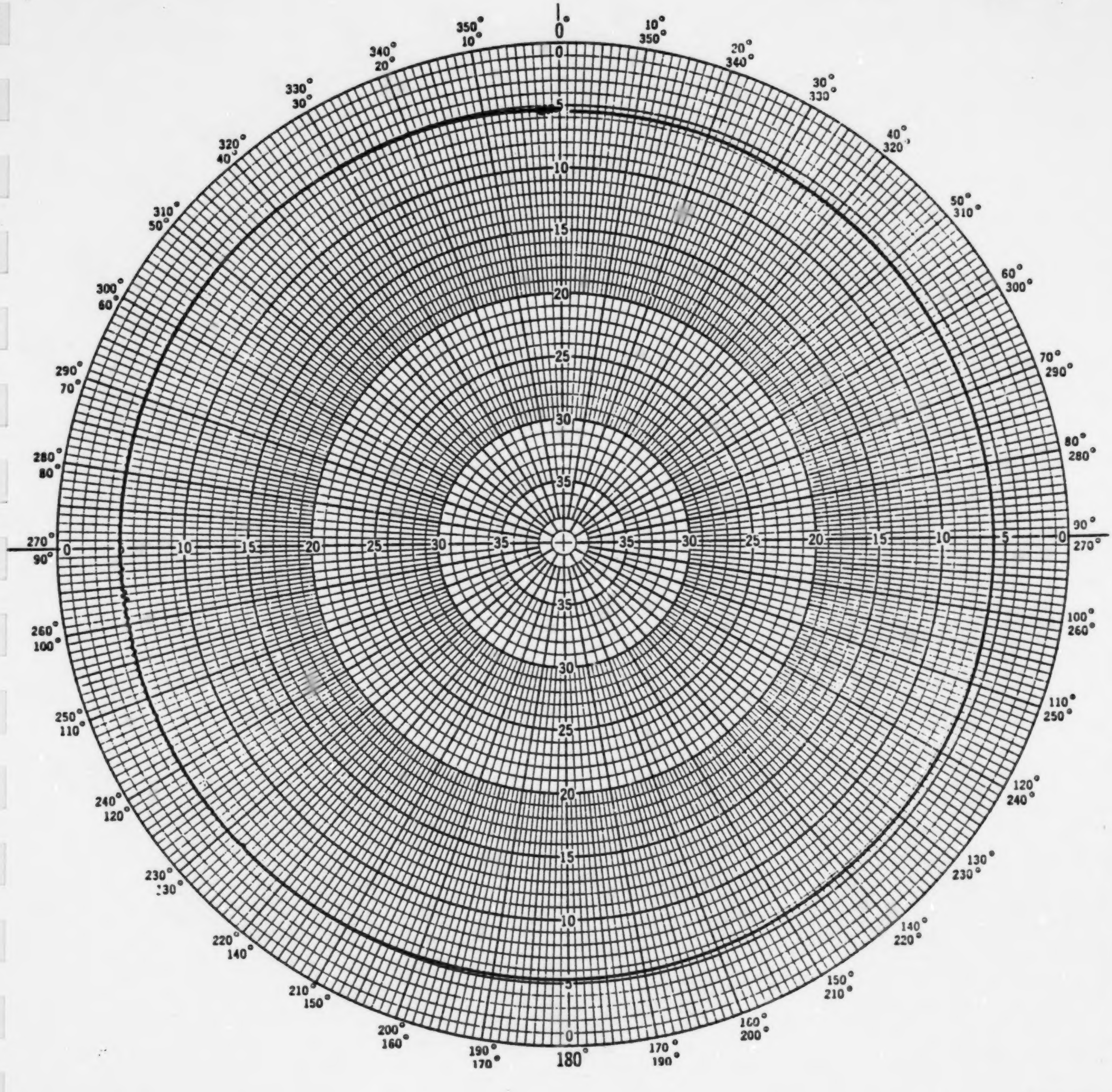

AXIS
4"
DIPOLE
HORIZONTAL

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS1



PATTERN: H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

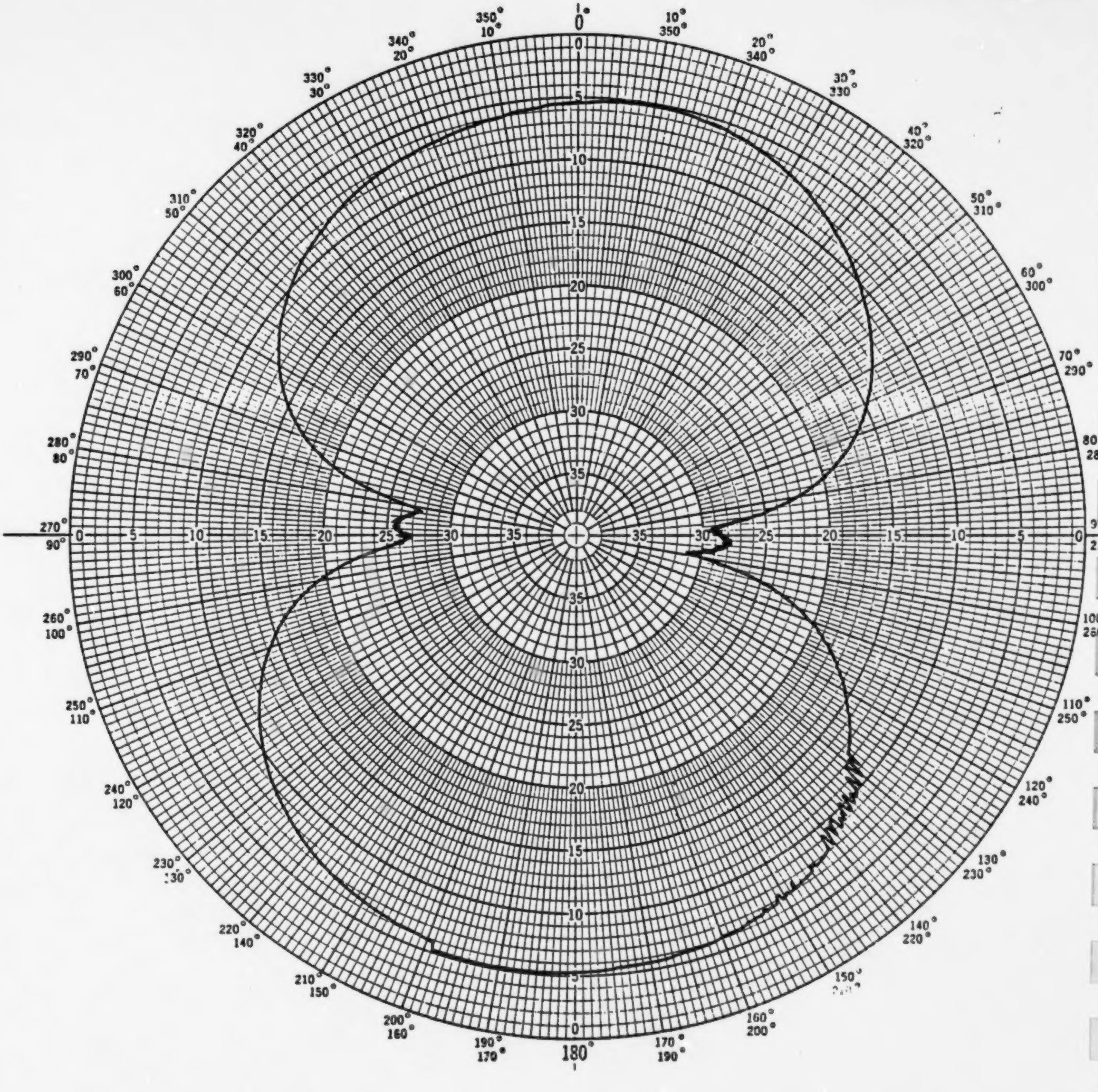
RING RADIUS: 4"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS2



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

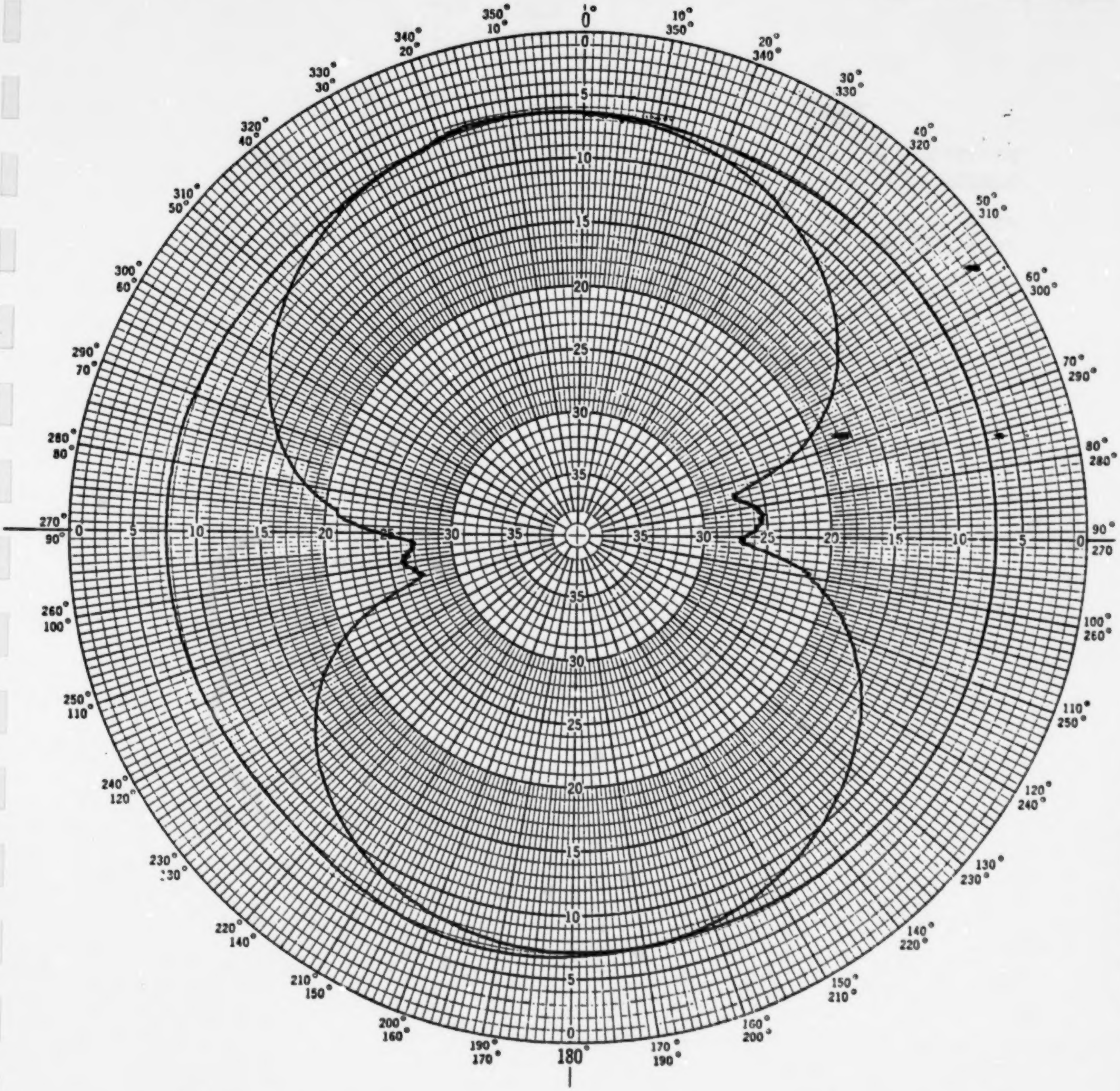
RING RADIUS: 4"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: EFS3



PATTERN: E/H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

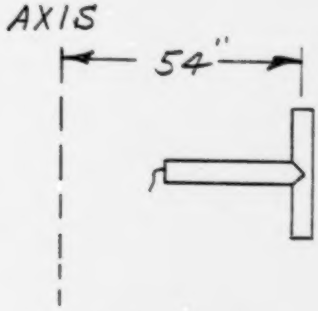
DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 4"

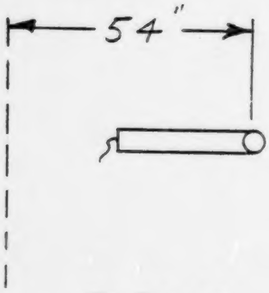
## MODEL "F"
## FREE SPACE MEASUREMENTS
Radius 54"
August 12, 1981

| PATTERN NUMBER * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | DIPOLE ORIENT-TATION | REMARKS |
|---|---|---|---|---|
| FFS4 (237) | 28.0 | E/H-PLANE | HOZ. | |
| FFS5 (238) | 18.0 | H-PLANE | VERT. | |

*Page Numbers



DIPOLE
VERTICAL



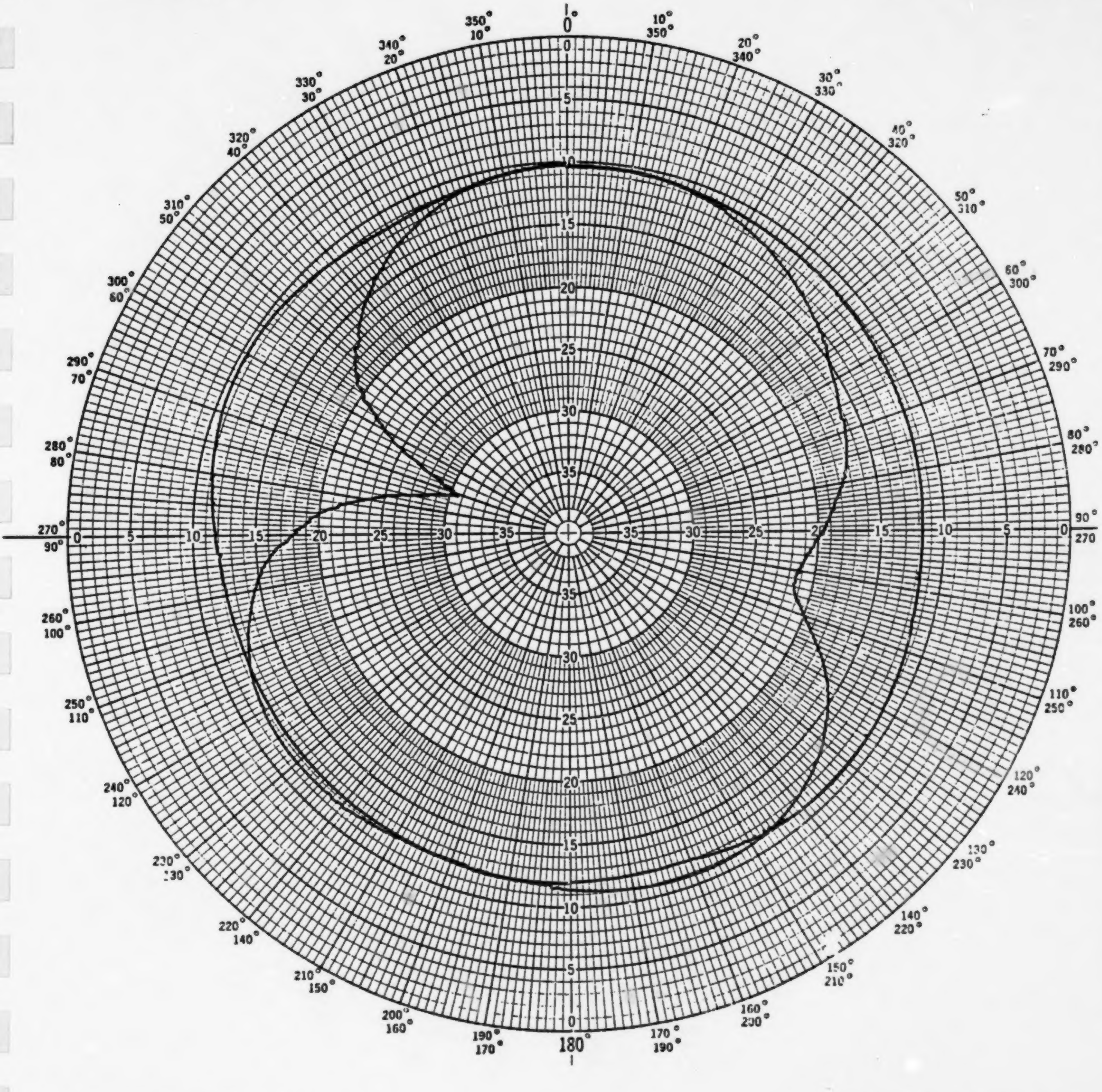
DIPOLE
HORIZONTAL

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FES4



PATTERN: E/H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 28.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT

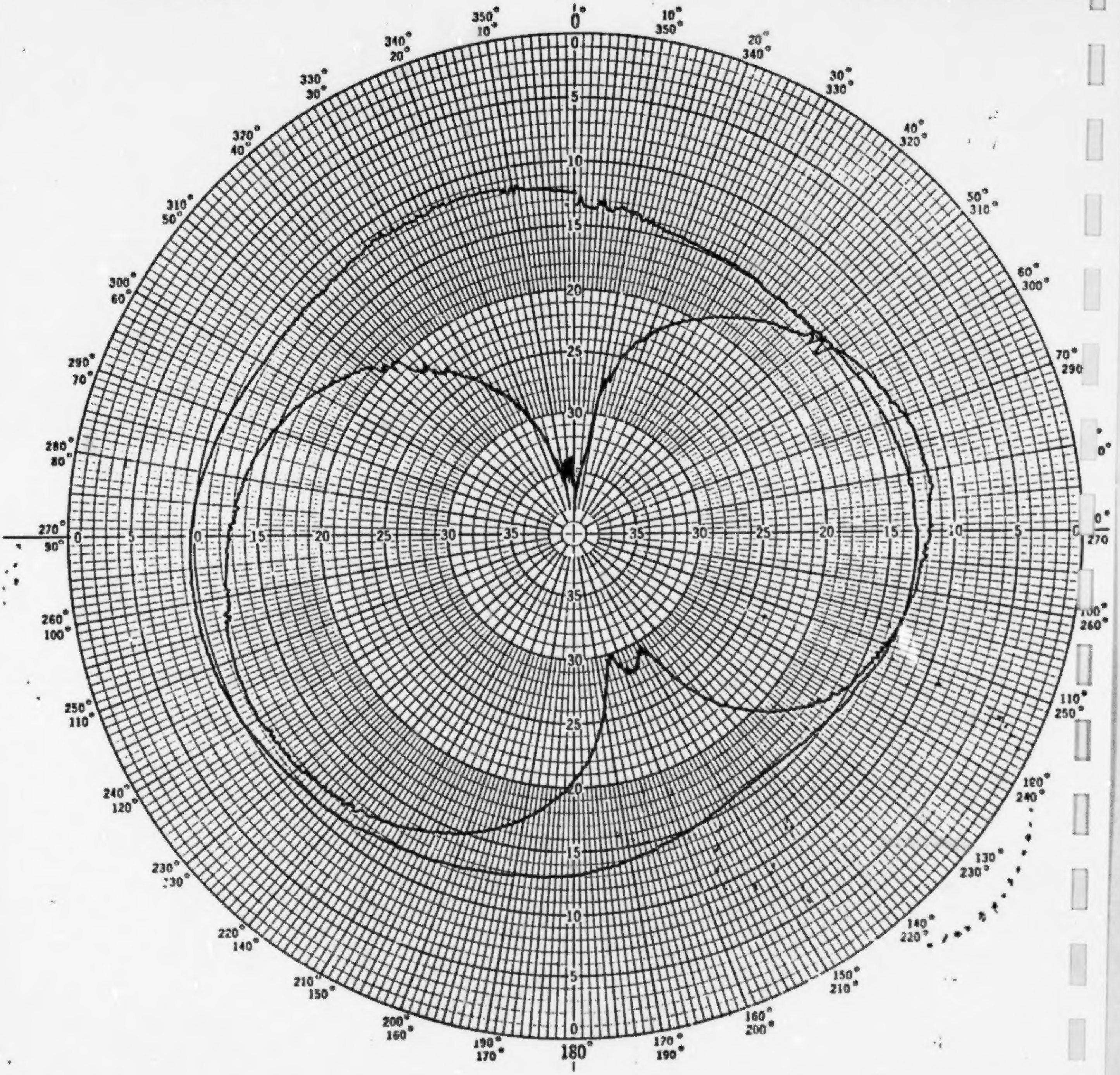
RING RADIUS: 54"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS5



PATTERN: H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

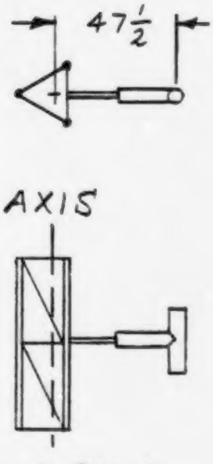
HEIGHT OF TRANSMITTI G
ANTENNA: 18.0 FT.

DIST. FROM TRANS. AN .
TO TEST ANT.: 131 FT.

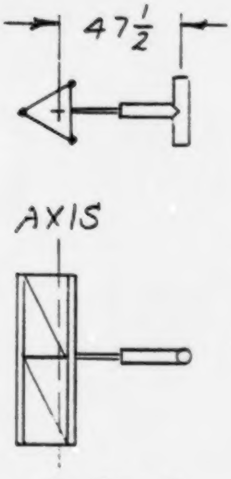
RING RADIUS: 54"

MODEL "F"
ANTENNA MOUNTED
ON TOWER FACE
August 12, 1981

| PATTERN NUMBER | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | DIPOLE ORIENTATION | REMARKS |
|---|---|---|---|---|
| FF1 (240) | 19.0 | E/H-PLANE | HOZ. | |
| FF2 (241) | 16.0 | E/H-PLANE | VERT. | |



DIPOLE
VERTICAL



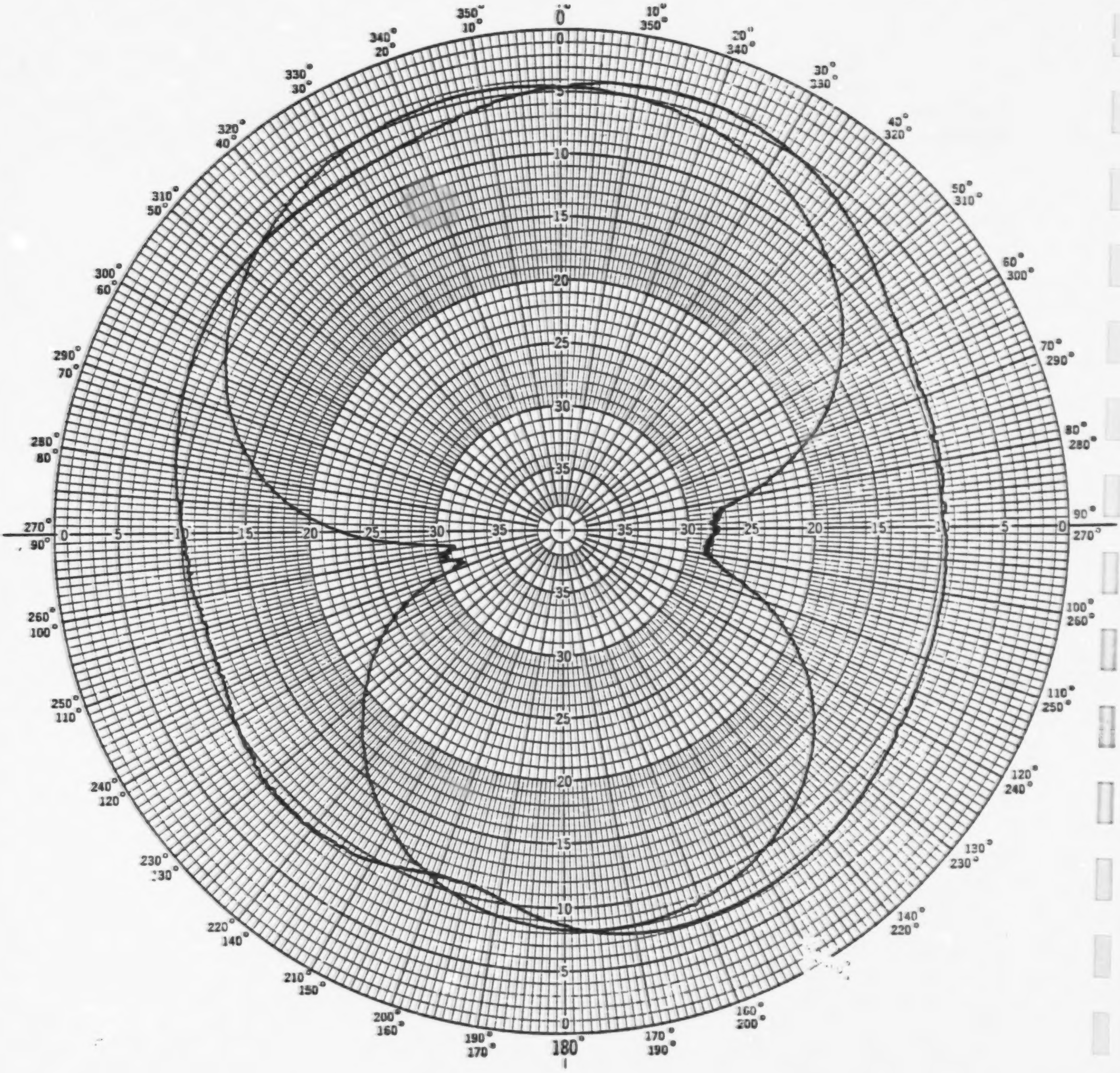
DIPOLE
HORIZONTAL

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FE1



PATTERN: E/H-PLANE

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT

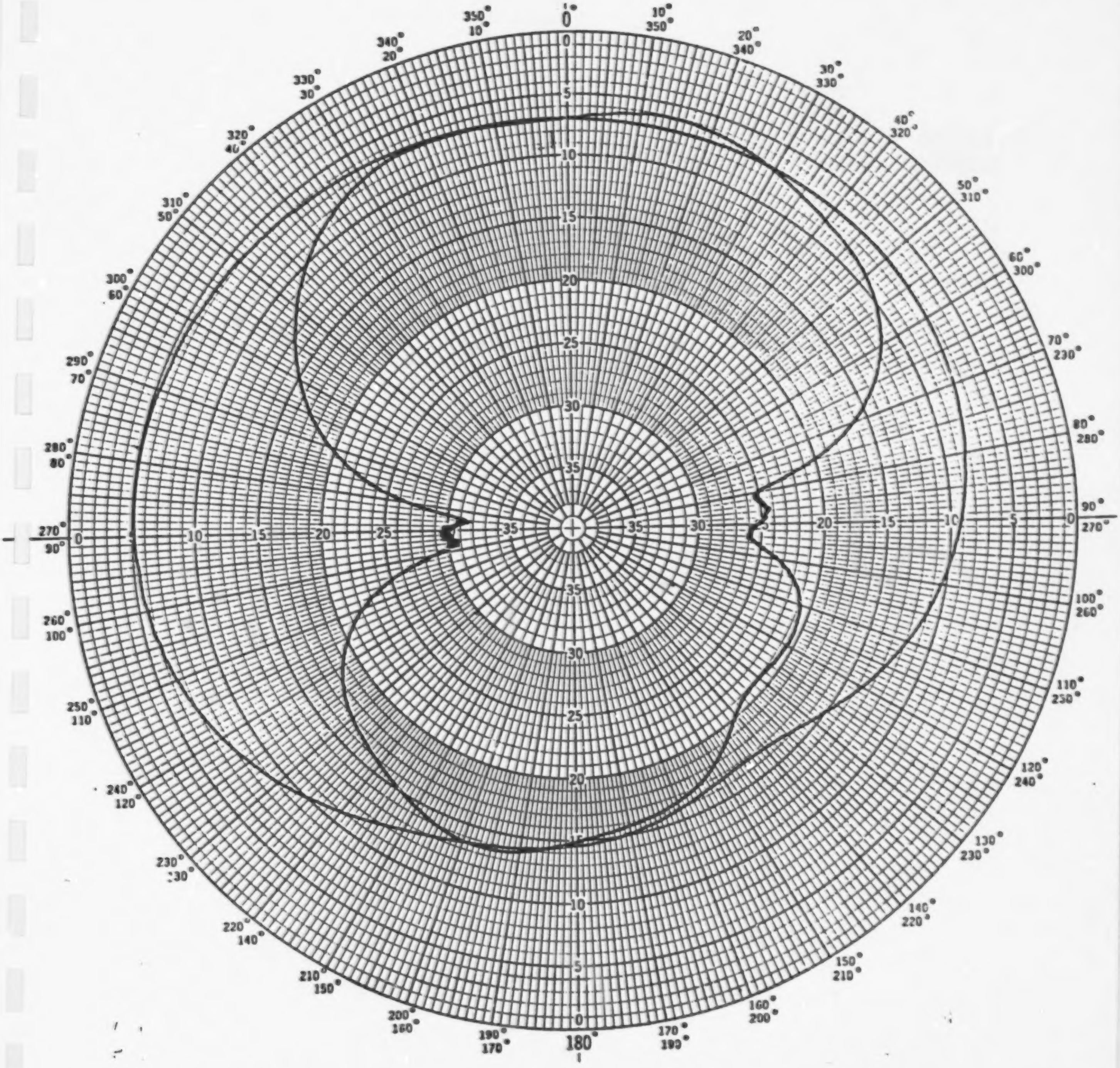
RING RADIUS: 47.5"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FF2



PATTERN: E/H PLANE

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 16.0 FT.

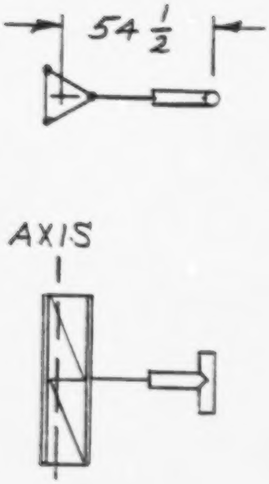
DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 47.5"

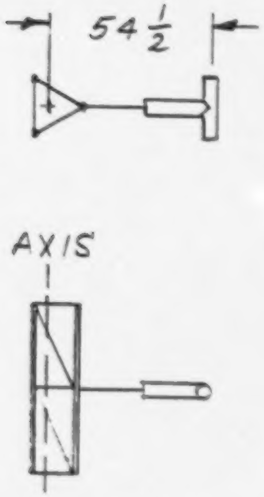
MODEL "F"
ANTENNA MOUNTED
ON TOWER LEG
August 11, 1981

| PATTERN NUMBER * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | DIPOLE ORIENTATION | REMARKS |
|---|---|---|---|---|
| FL1 (243) | 19.0 | E/H-PLANE | HOZ. | |
| FL2 (244) | 16.0 | E/H-PLANE | VERT. | |

*Page Numbers



DIPOLE
VERTICAL



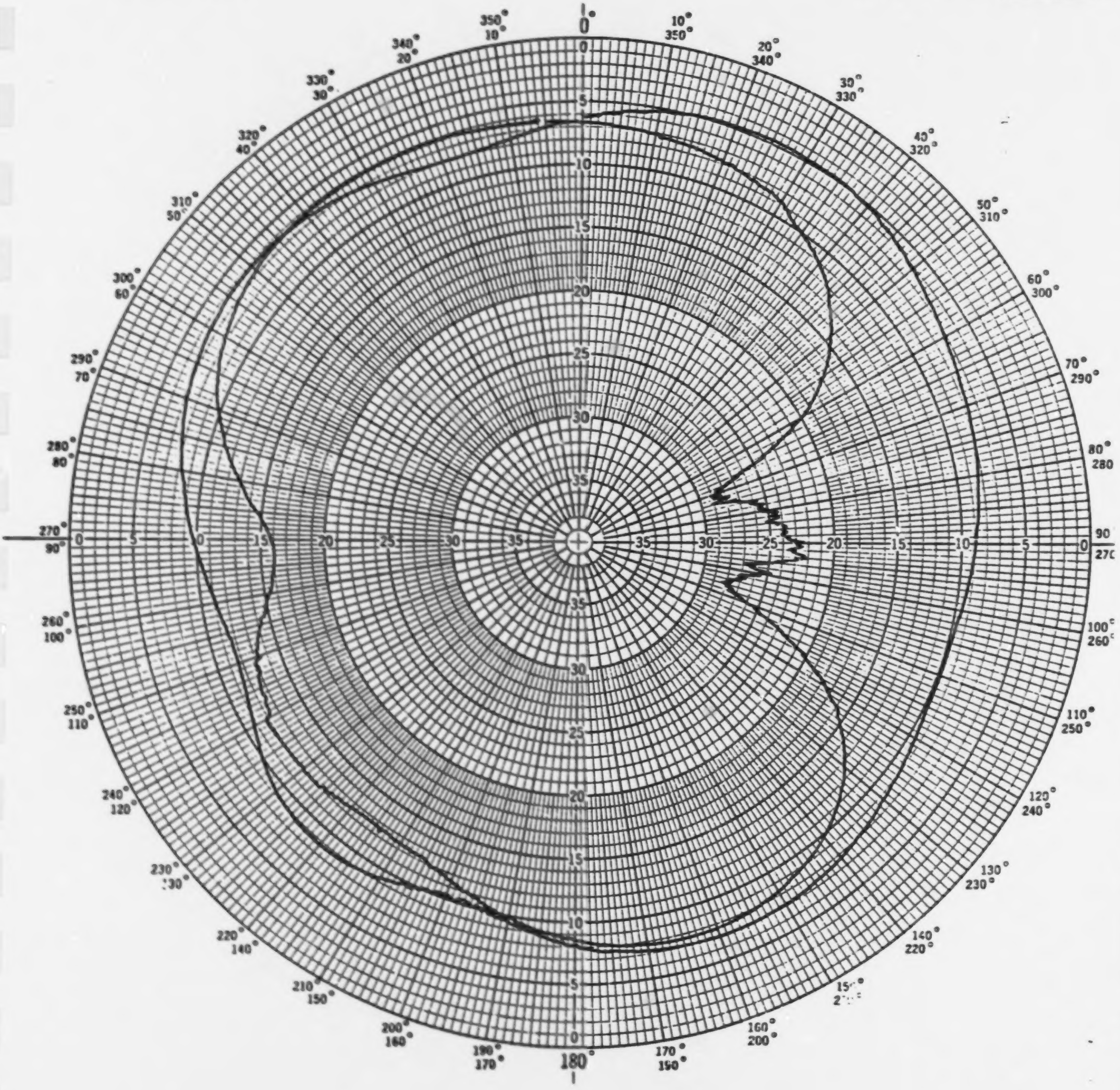
DIPOLE
HORIZONTAL

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FL1



PATTERN: E/H-PLANE

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

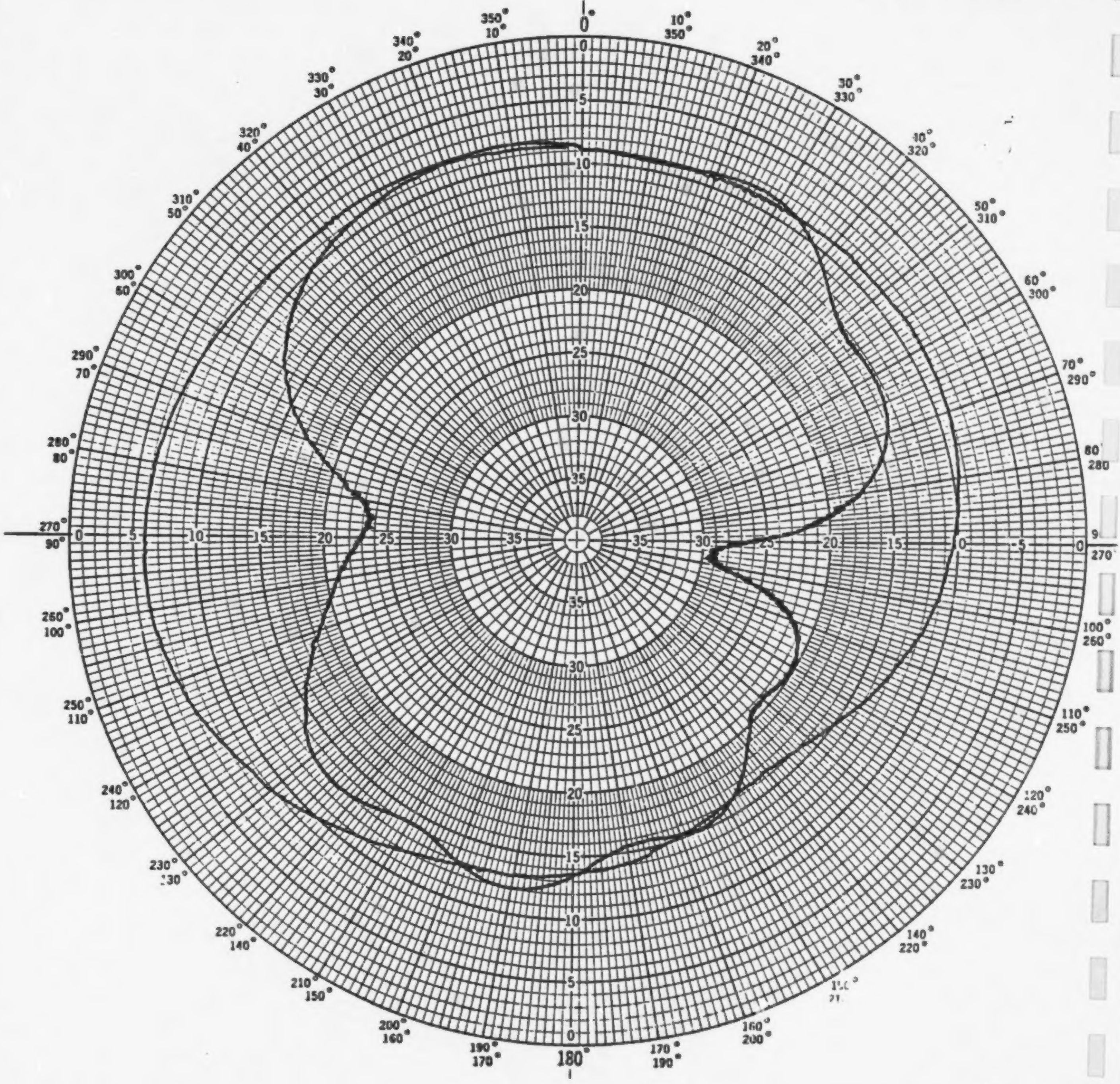
RING RADIUS: 54.5"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FL2



PATTERN: E/H PLANE

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT

HEIGHT OF TRANSMITTING
ANTENNA: 16.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT

RING RADIUS: 54.5"

## V. SUMMARY OF MEASURED PATTERNS

The patterns for each test antenna and each polarization are summarized in the following graphs. Superimposed on each pattern is the (a) Free Space Pattern, (b) Leg Pattern and (c) Face Pattern:

PAGE

(A) MODEL "A": FREE SPACE, FACE AND LEG MEASUREMENTS

1. AZIMUTH, HORIZONTALLY POLARIZED 246
2. AZIMUTH, VERTICALLY POLARIZED 247
3. ELEVATION, HORIZONTALLY POLARIZED 248
4. ELEVATION, VERTICALLY POLARIZED 249

(B) MODEL "B": FREE SPACE, FACE AND LEG MEASUREMENTS

5. AZIMUTH, HORIZONTALLY POLARIZED 250
6. AZIMUTH, VERTICALLY POLARIZED 251
7. ELEVATION, HORIZONTALLY POLARIZED 252
8. ELEVATION, VERTICALLY POLARIZED 253

(C) MODEL "C": FREE SPACE, FACE AND LEG MEASUREMENTS

9. AZIMUTH, HORIZONTALLY POLARIZED 254
10. AZIMUTH, VERTICALLY POLARIZED 255
11. ELEVATION, HORIZONTALLY POLARIZED 256
12. ELEVATION, VERTICALLY POLARIZED 257

(D) MODEL "D": FREE SPACE, FACE AND LEG MEASUREMENTS

13. AZIMUTH, HORIZONTALLY POLARIZED 258
14. AZIMUTH, VERTICALLY POLARIZED 259
15. ELEVATION, HORIZONTALLY POLARIZED 260
16. ELEVATION, VERTICALLY POLARIZED 261

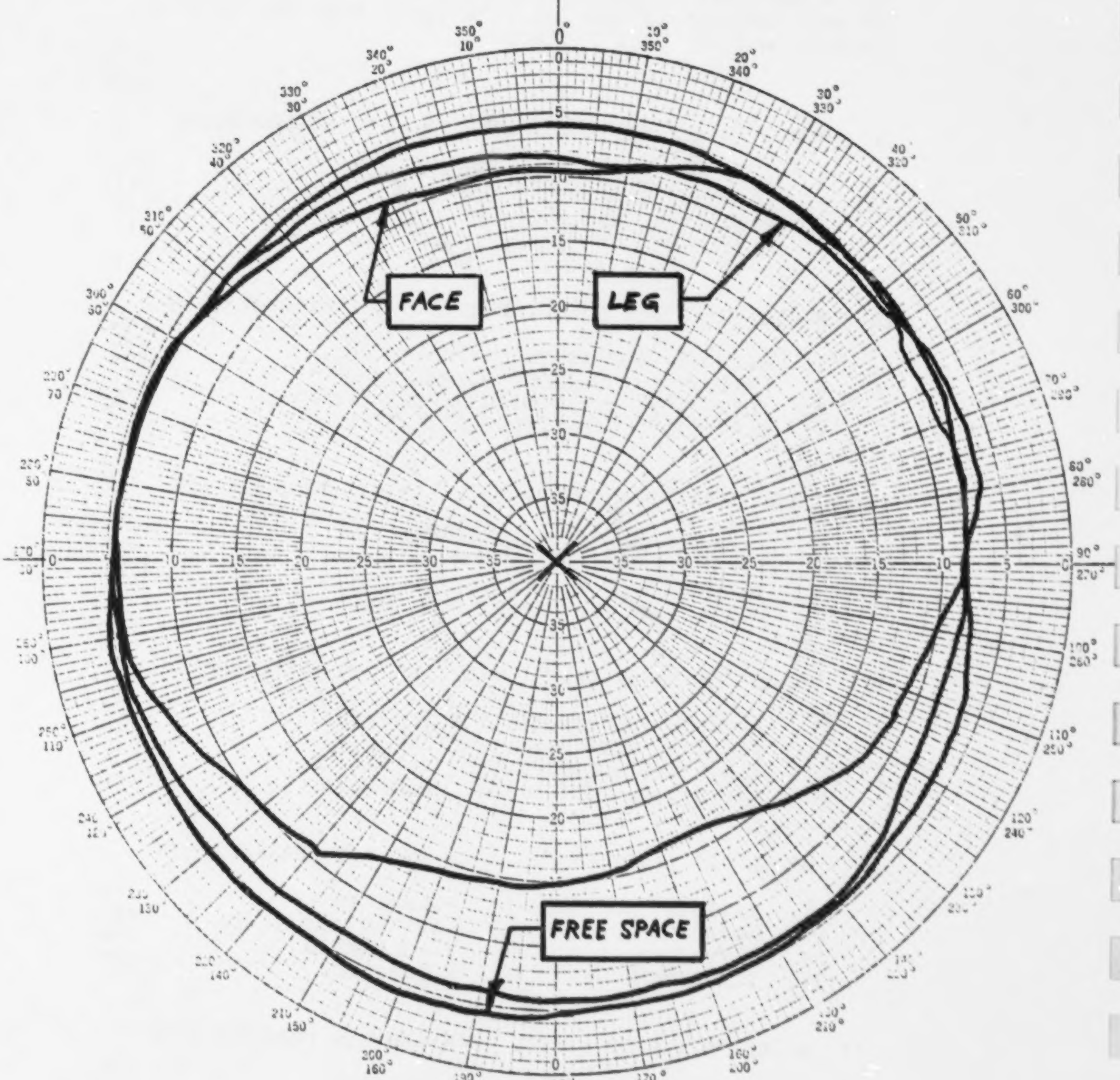
(E) MODEL "E": FREE SPACE, FACE AND LEG MEASUREMENTS

17. AZIMUTH, HORIZONTALLY POLARIZED 262
18. AZIMUTH, VERTICALLY POLARIZED 263
19. ELEVATION, HORIZONTALLY POLARIZED 264
20. ELEVATION, VERTICALLY POLARIZED 265

(F) MODEL "F": FREE SPACE, FACE AND LEG MEASUREMENTS

21. H-PLANE, HORIZONTALLY POLARIZED 266
22. H-PLANE, VERTICALLY POLARIZED 267
23. E-PLANE, HORIZONTALLY POLARIZED 268
24. E-PLANE, VERTICALLY POLARIZED 269

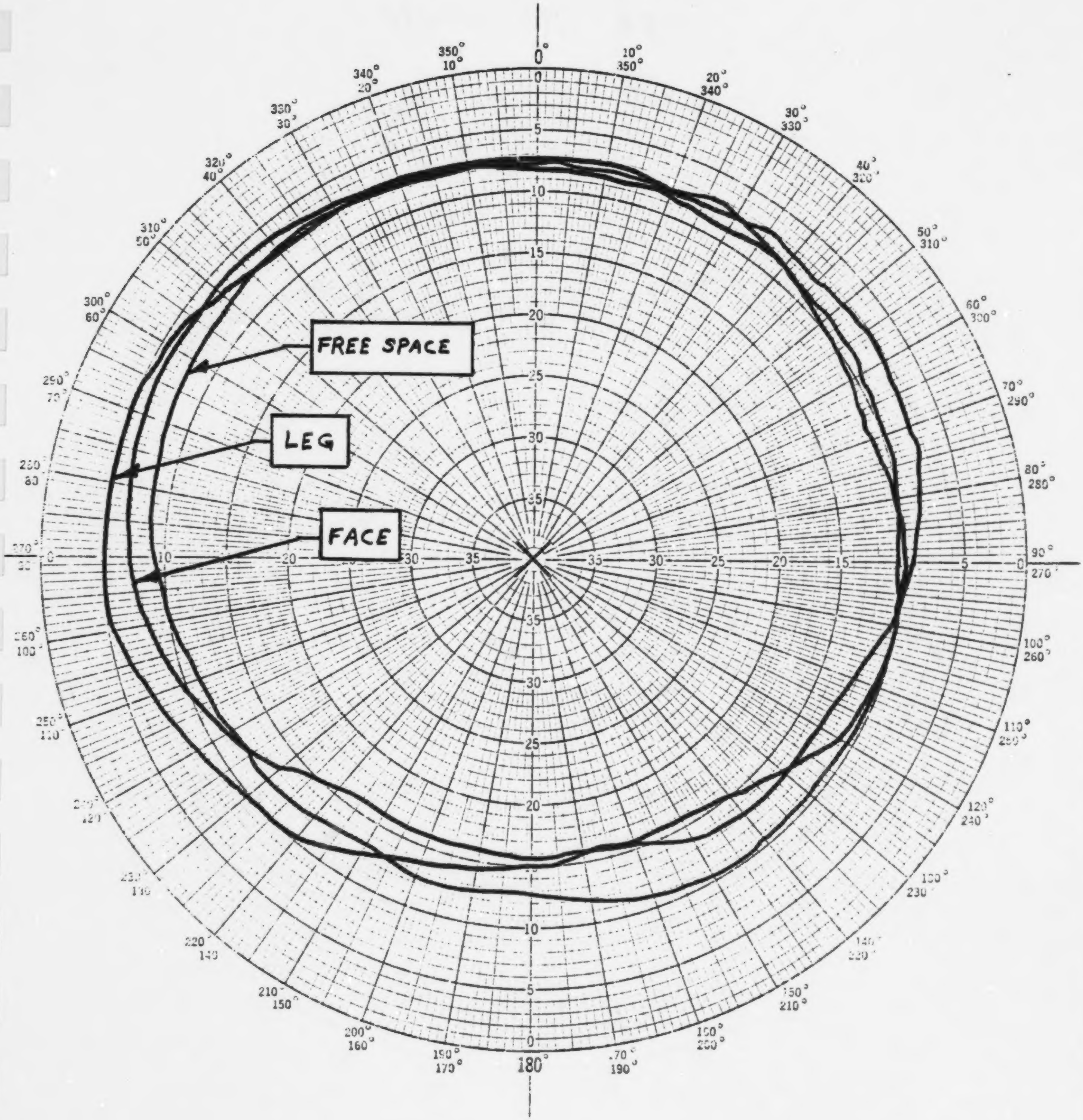
# MODEL "A"
# AZIMUTH PATTERN
# HOZ. POLARIZED



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

2

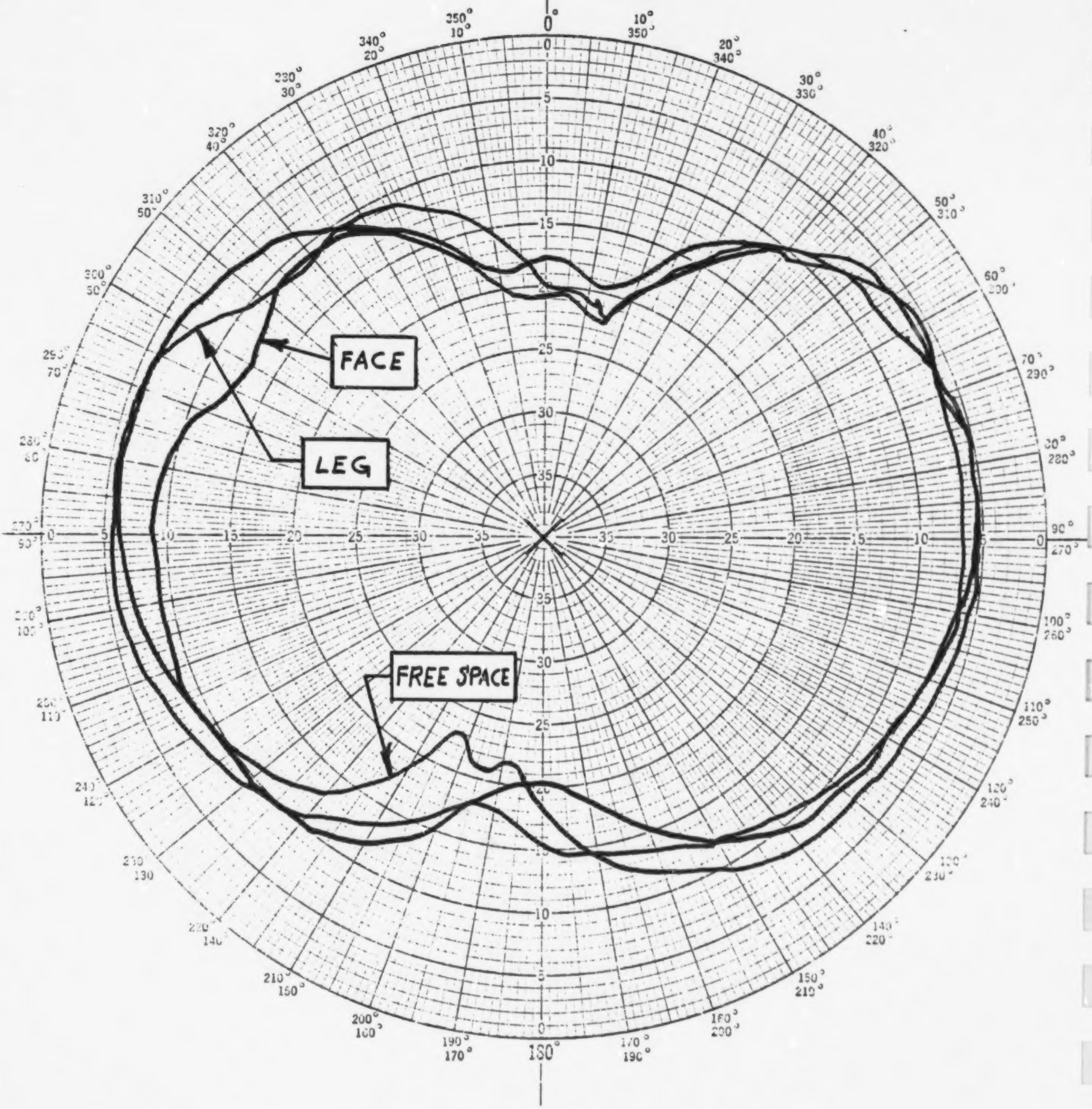
# MODEL "-A-"
# AZIMUTH PATTERN
# VERT. POLARIZED



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

3

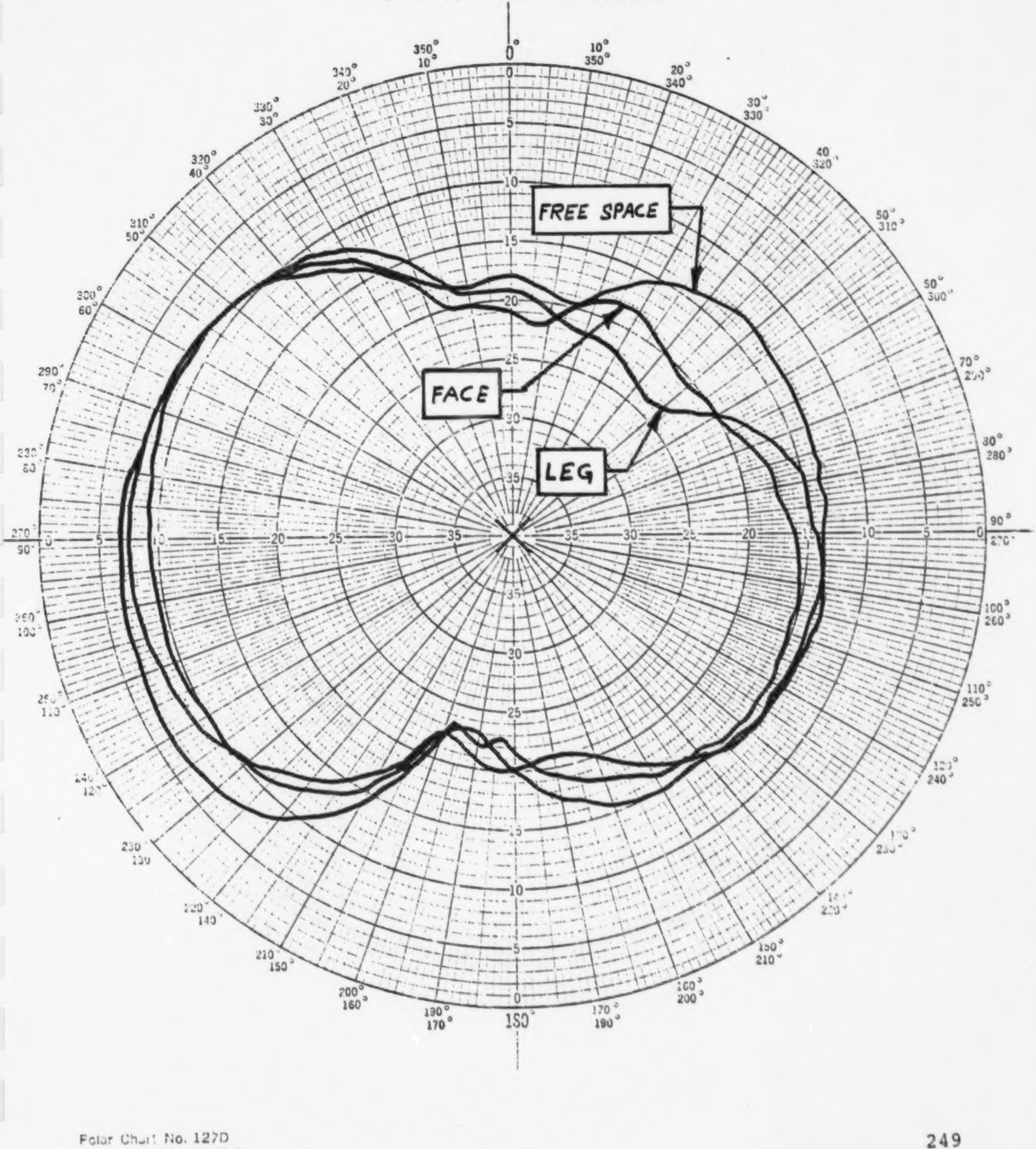
# MODEL "-A-"
# ELEVATION PATTERN
# 0 – 180°
# HOZ. POLARIZED



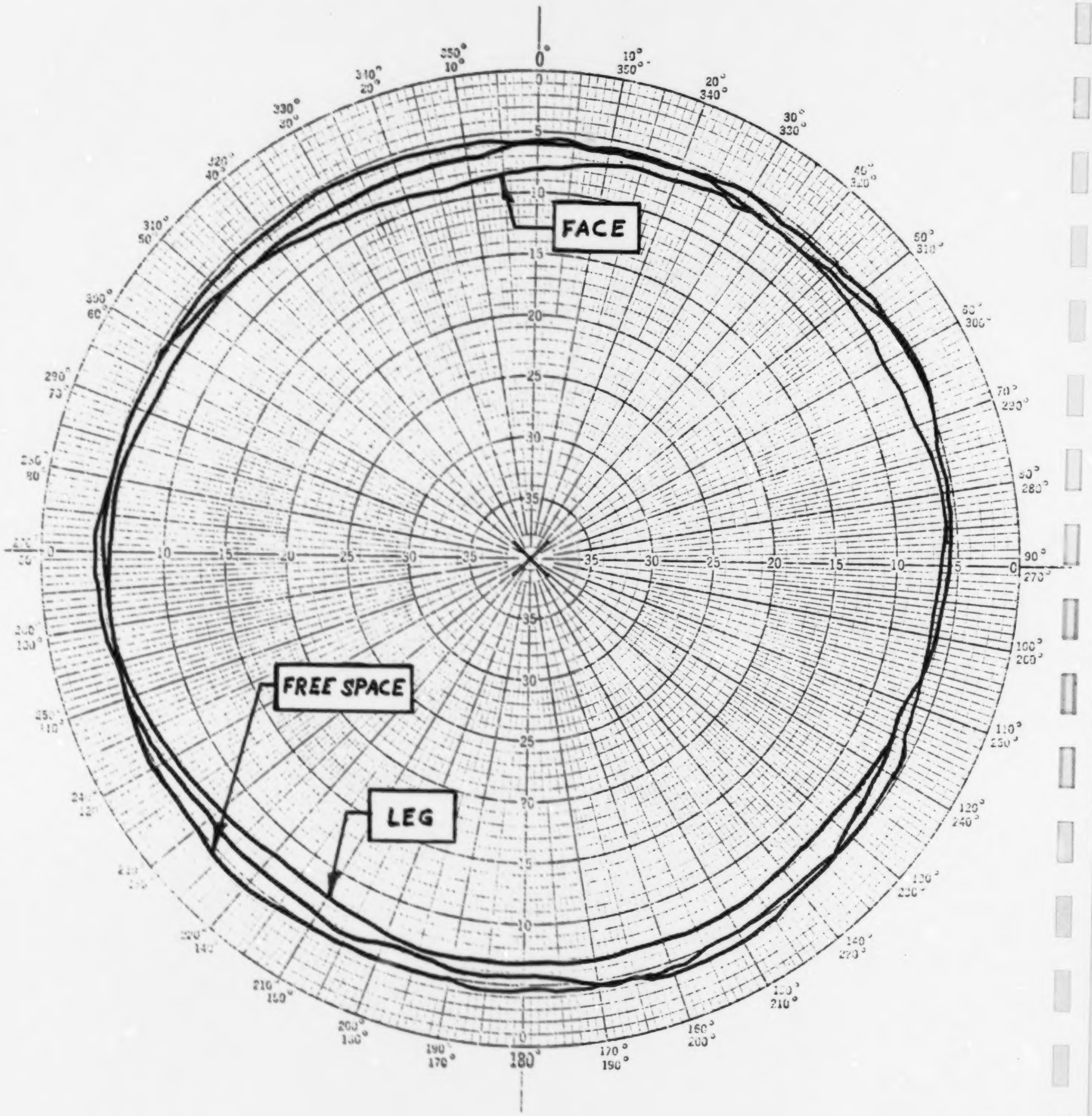
Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

4

# MODEL "A"
ELEVATION PATTERN
0-180° CUT
VERT. POLARIZED

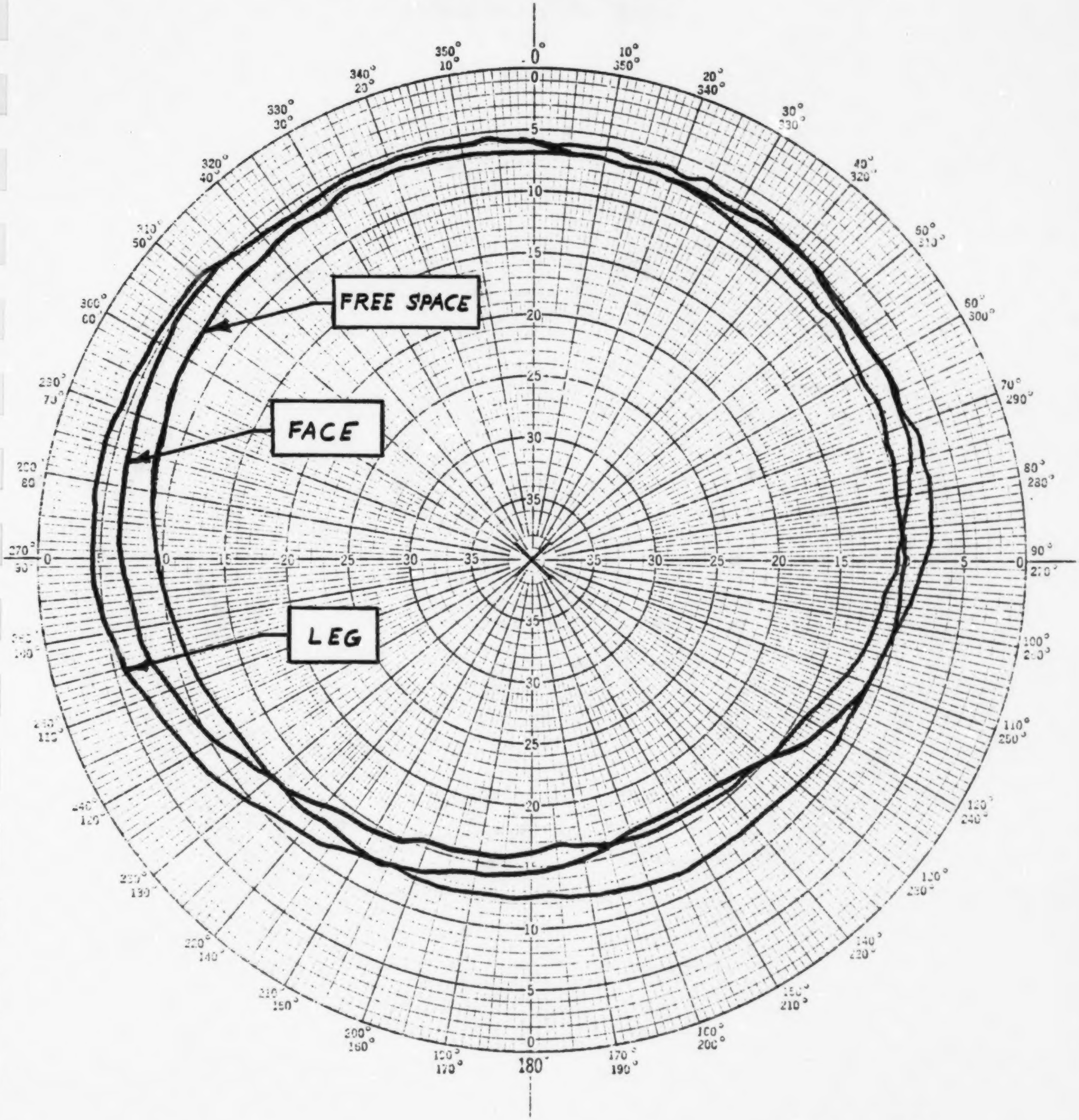


# MODEL "-B-"
# AZIMUTH PATTERN
# HOZ. POLARIZED



Polar Chart No. 1270
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

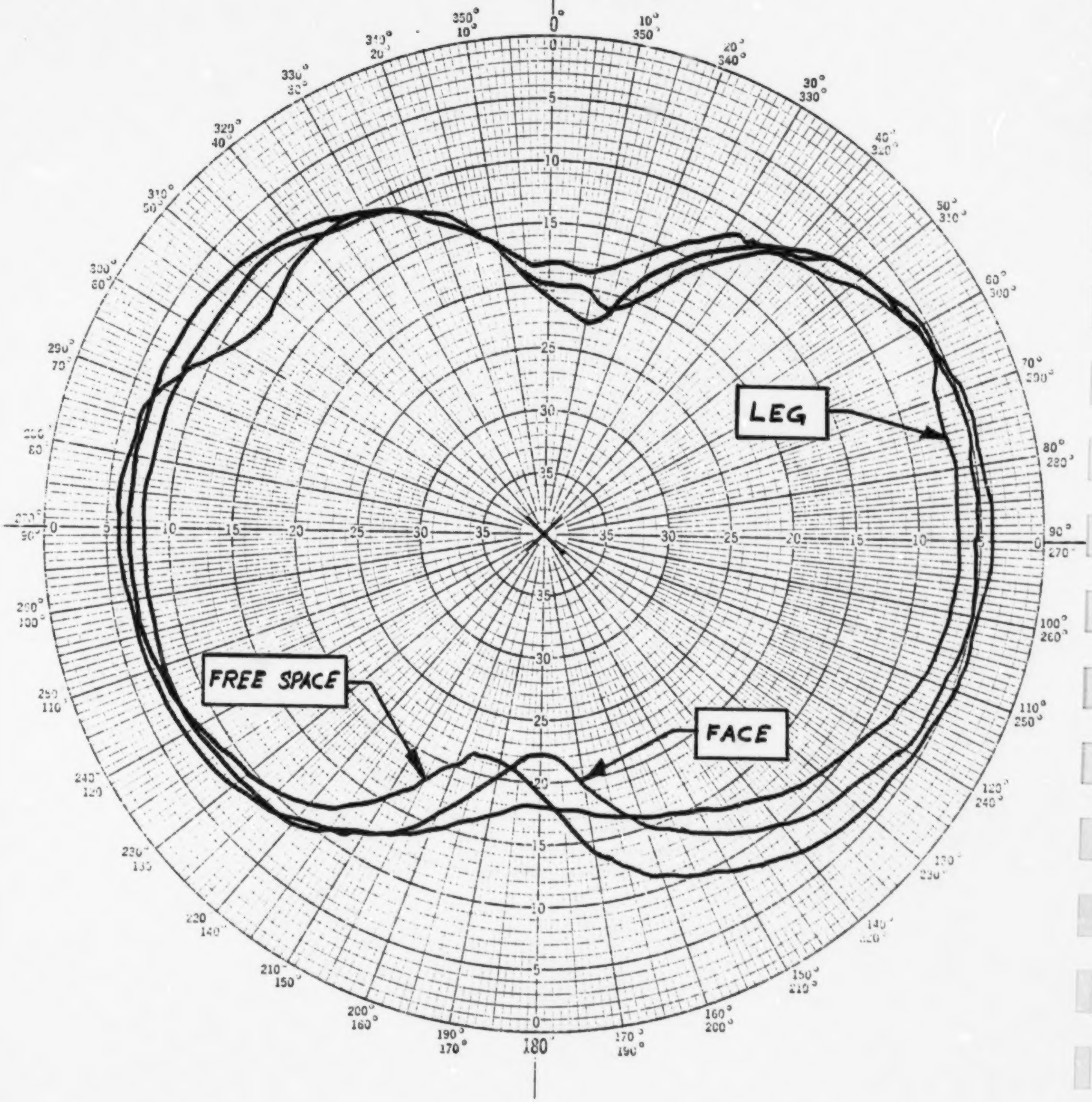
# MODEL "-B-"
# AZIMUTH PATTERN
# VERT. POLARIZED



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

7

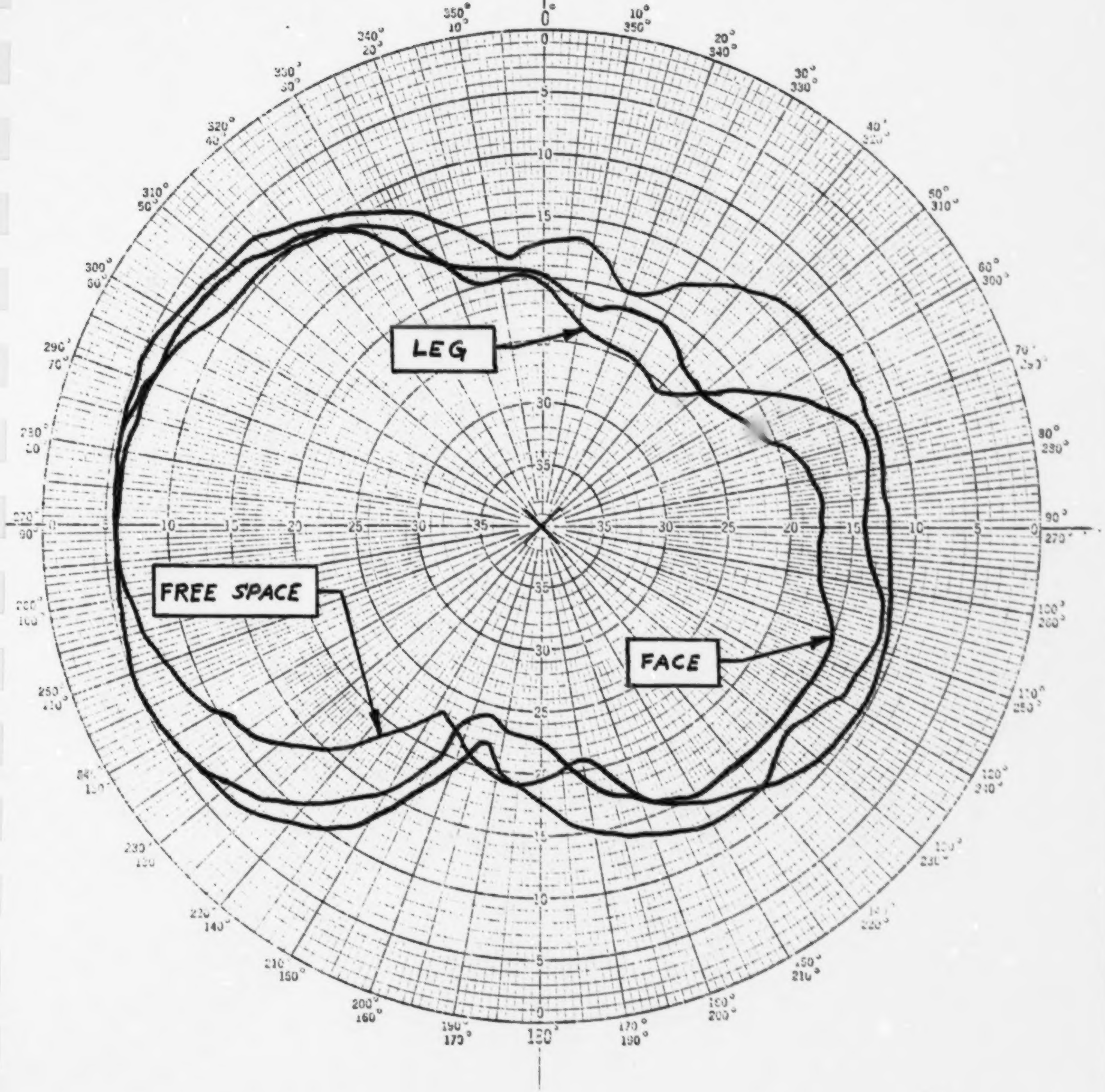
# MODEL "B"
# ELEVATION PATTERN
# 0-180° CUT
# HOZ. POLARIZED



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

8

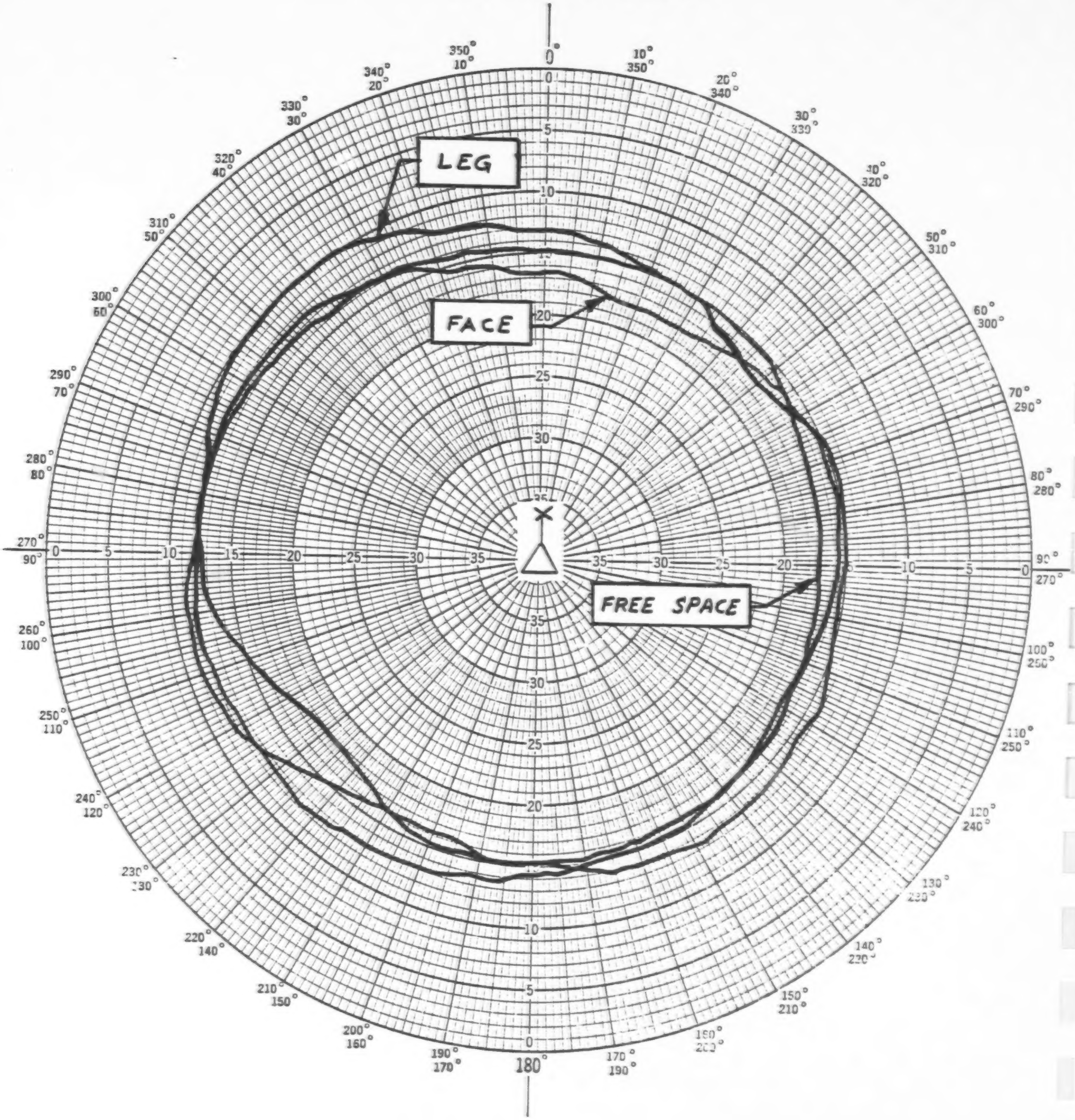
MODEL "-8-"
ELEVATION PATTERN
0-180° CUT
VERT. POLARIZED



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

9

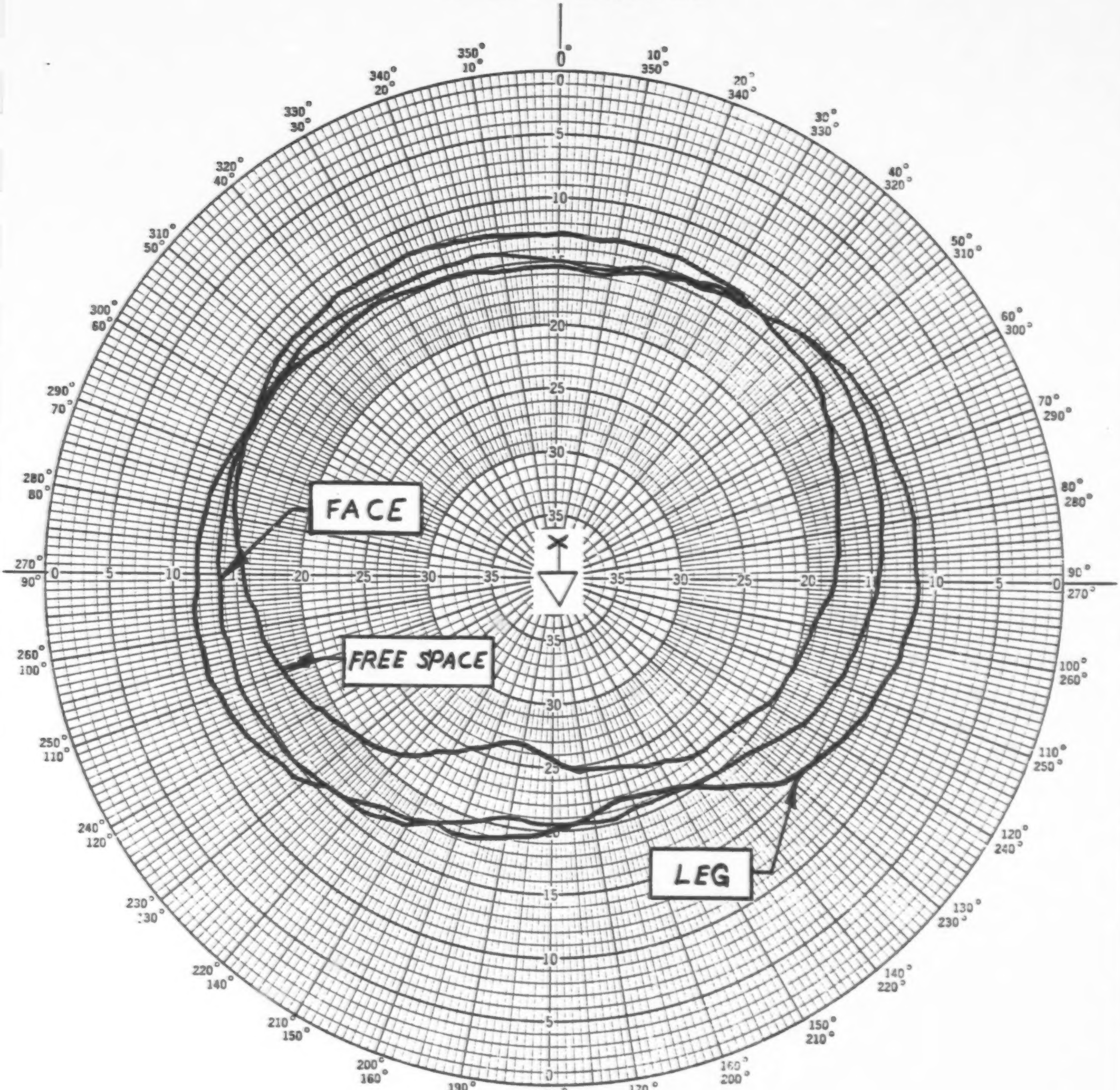
# MODEL "-C-"
# AZIMUTH PATTERN
# HOZ. POLARIZED



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

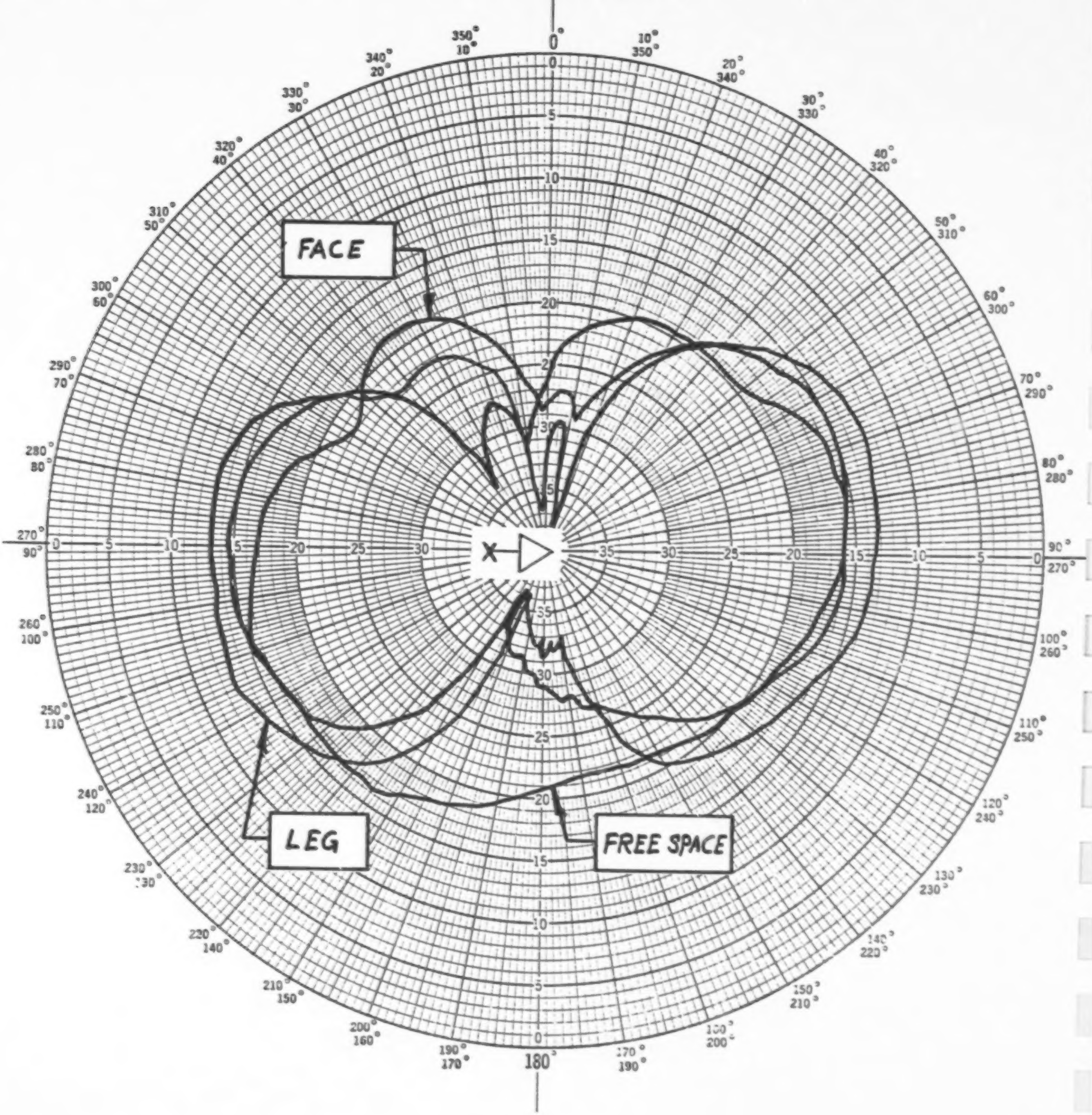
# MODEL "-C-"
# AZIMUTH PATTERN
# VERT. POLARIZED

10



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

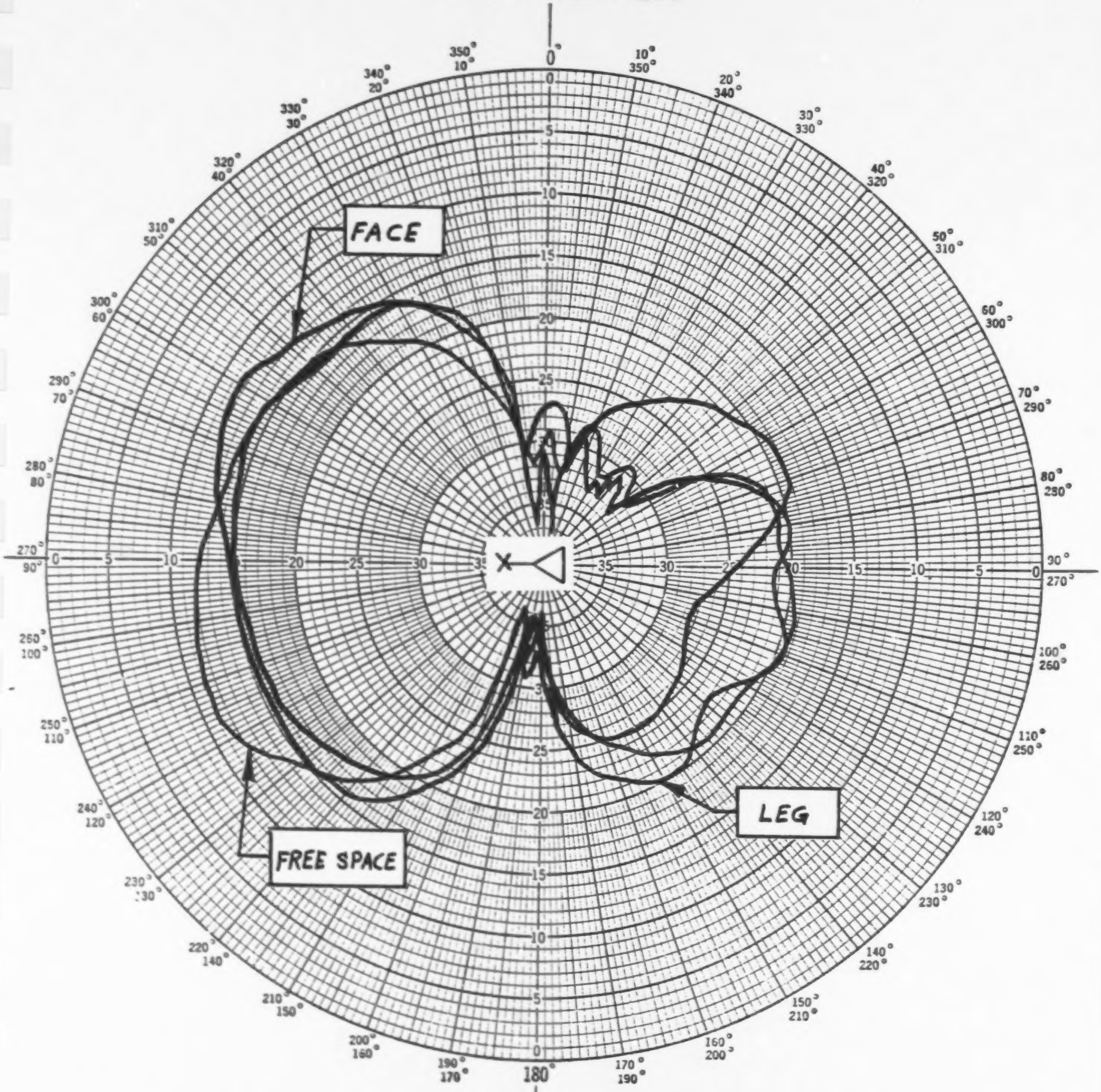
# MODEL "-C-"
# ELEVATION PATTERN
# 0-180° CUT
# HOZ. POLARIZED



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

12

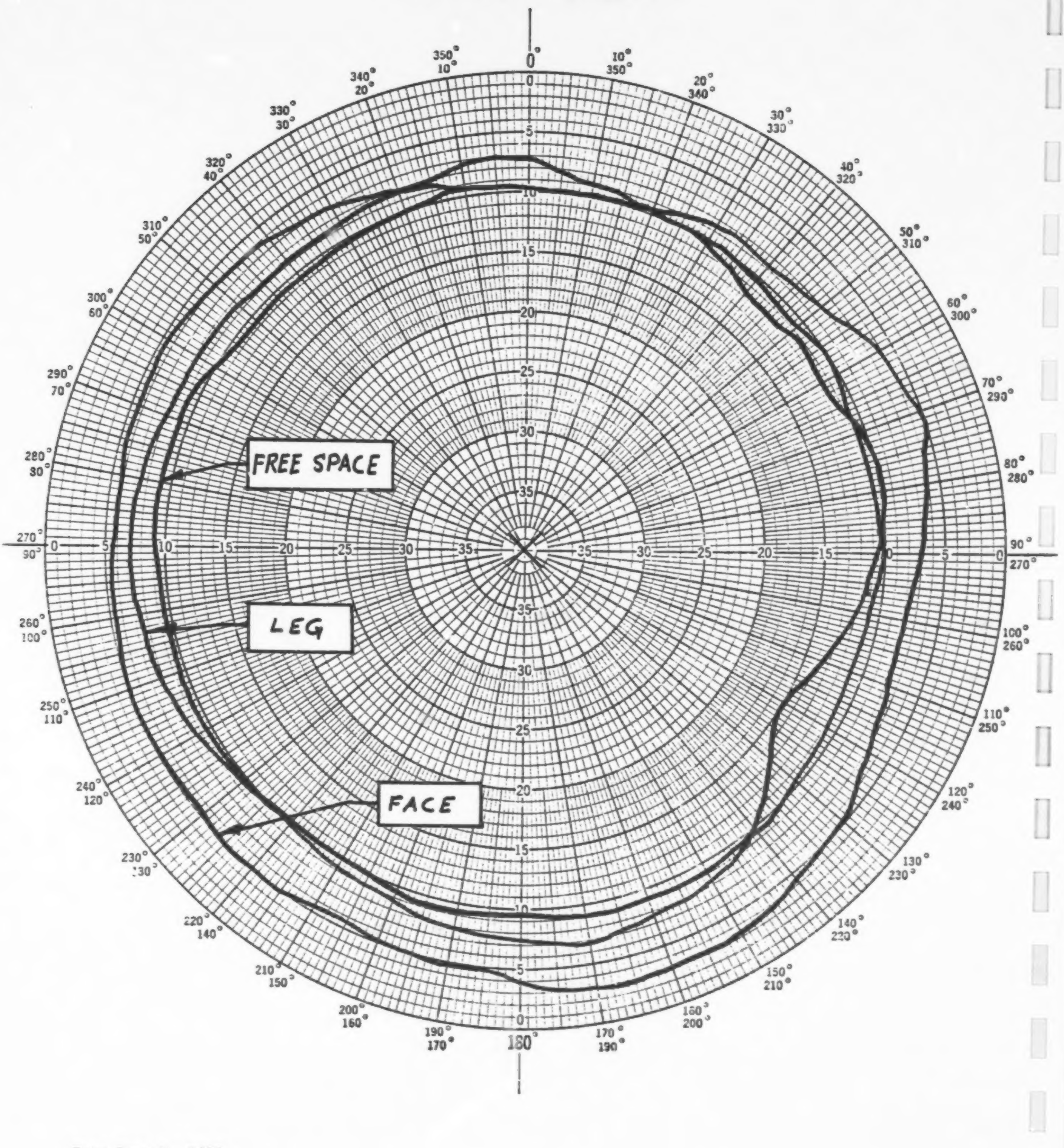
# MODEL "C"
# ELEVATION PATTERN
# 0 - 180° CUT
# VERT. POLARIZED



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

13

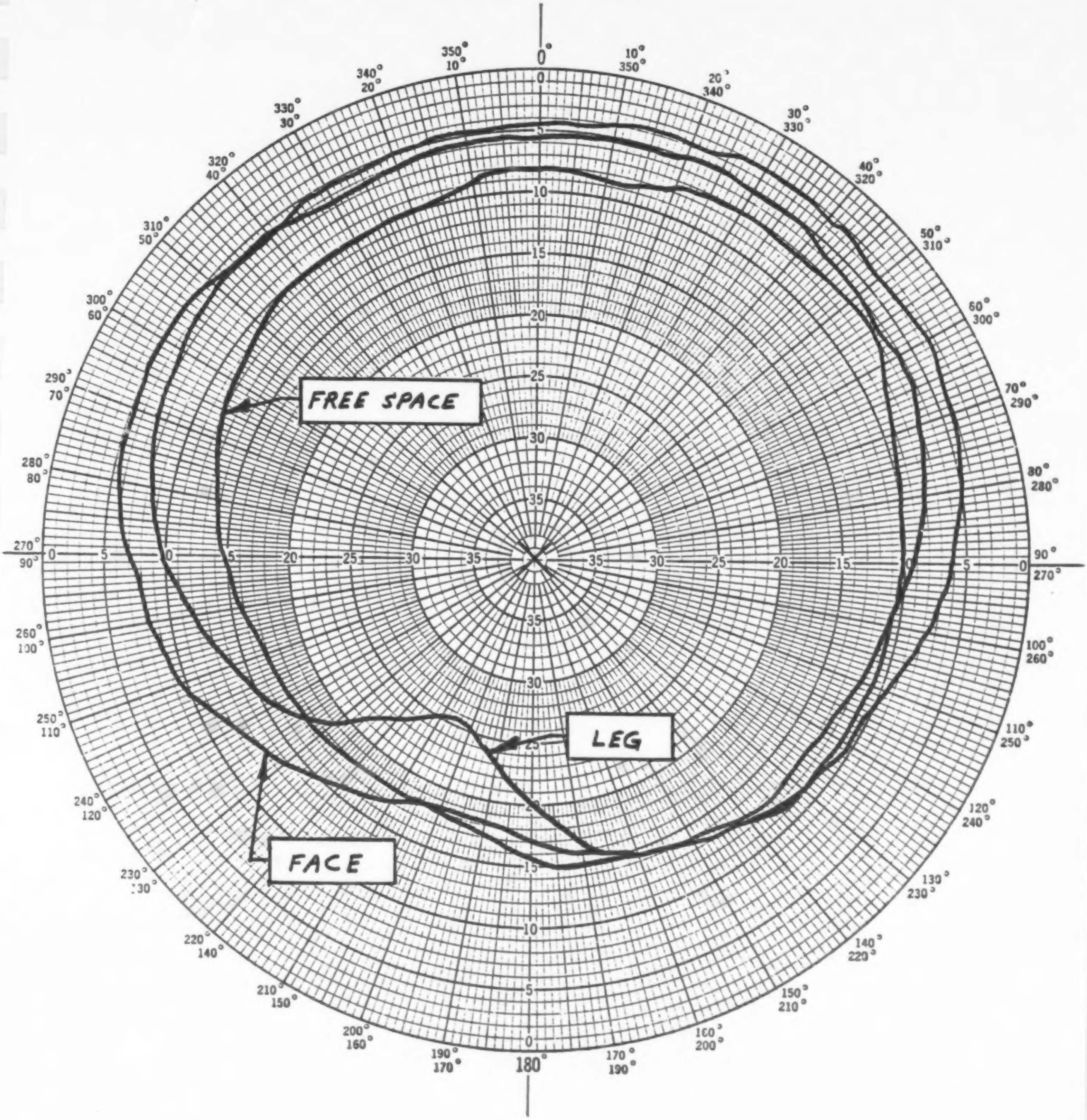
# MODEL "-D-"
# AZIMUTH PATTERN
# HOZ. POLARIZED



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

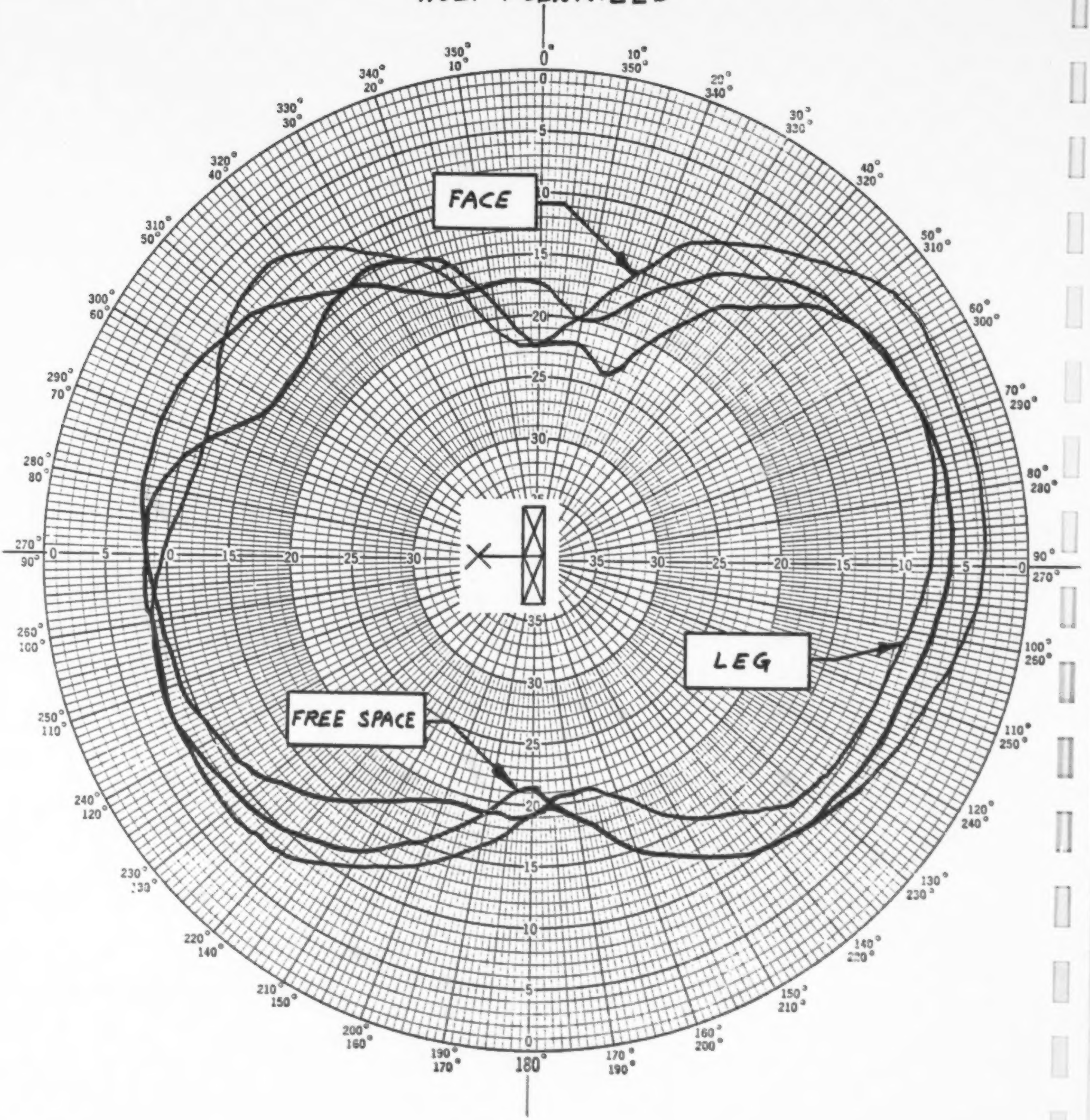
14

# MODEL "-D-"
# AZIMUTH PATTERN
# VERT. POLARIZED



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

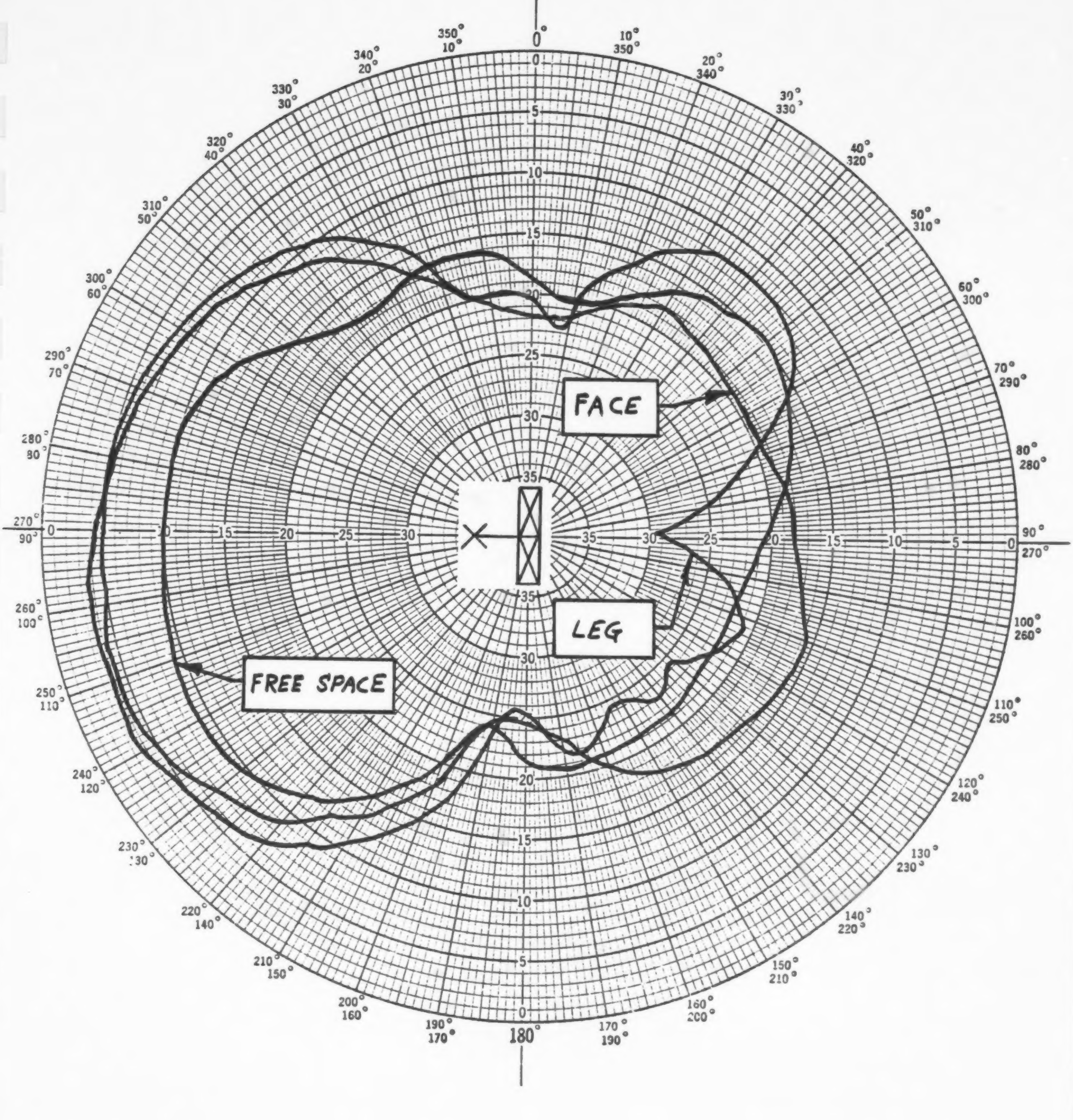
MODEL "-D-"
ELEVATION PATTERN
0-180° CUT
HOZ. POLARIZED



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

16

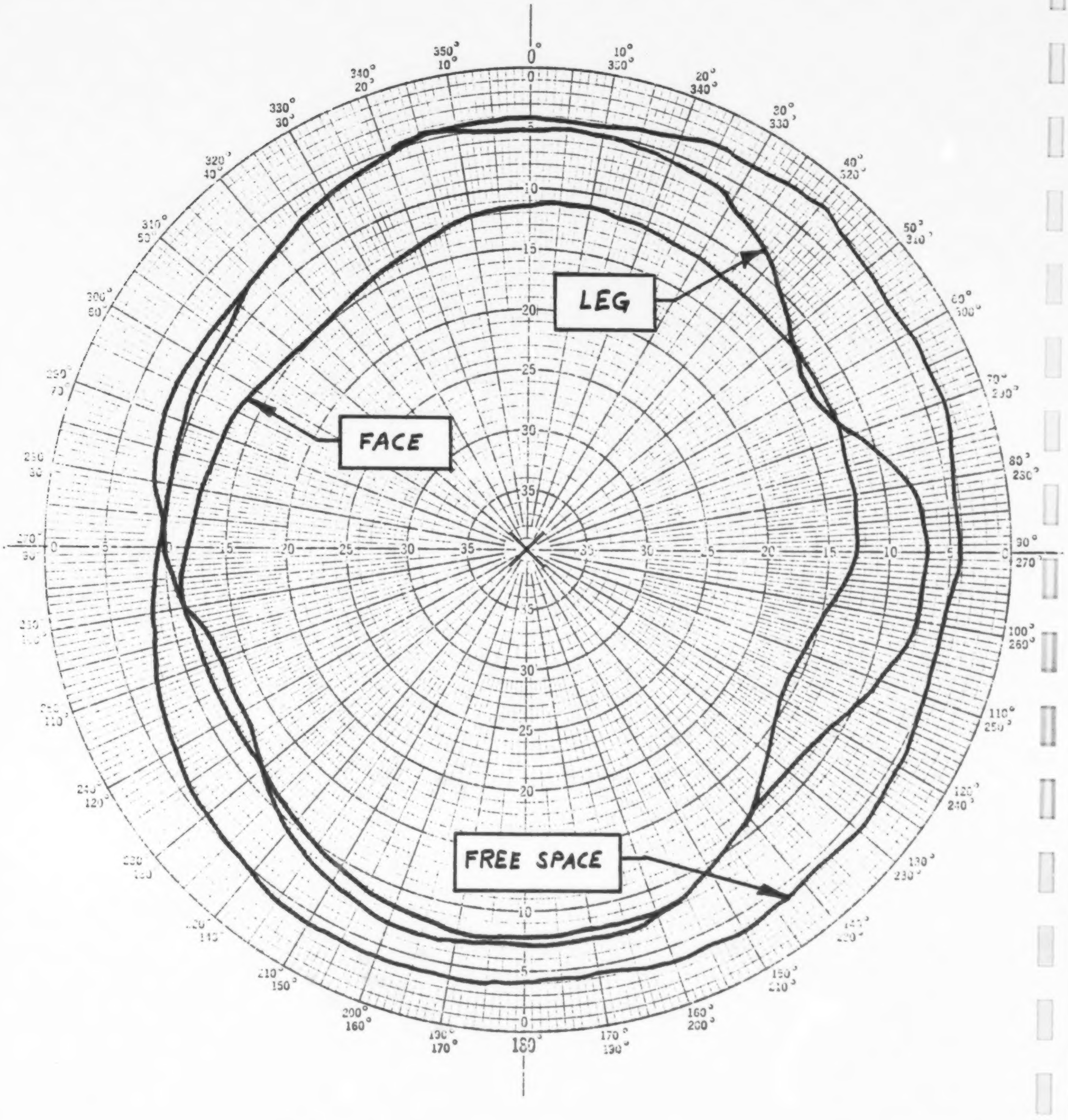
MODEL "-D-"
ELEVATION PATTERN
0-180° CUT
VERT. POLARIZED



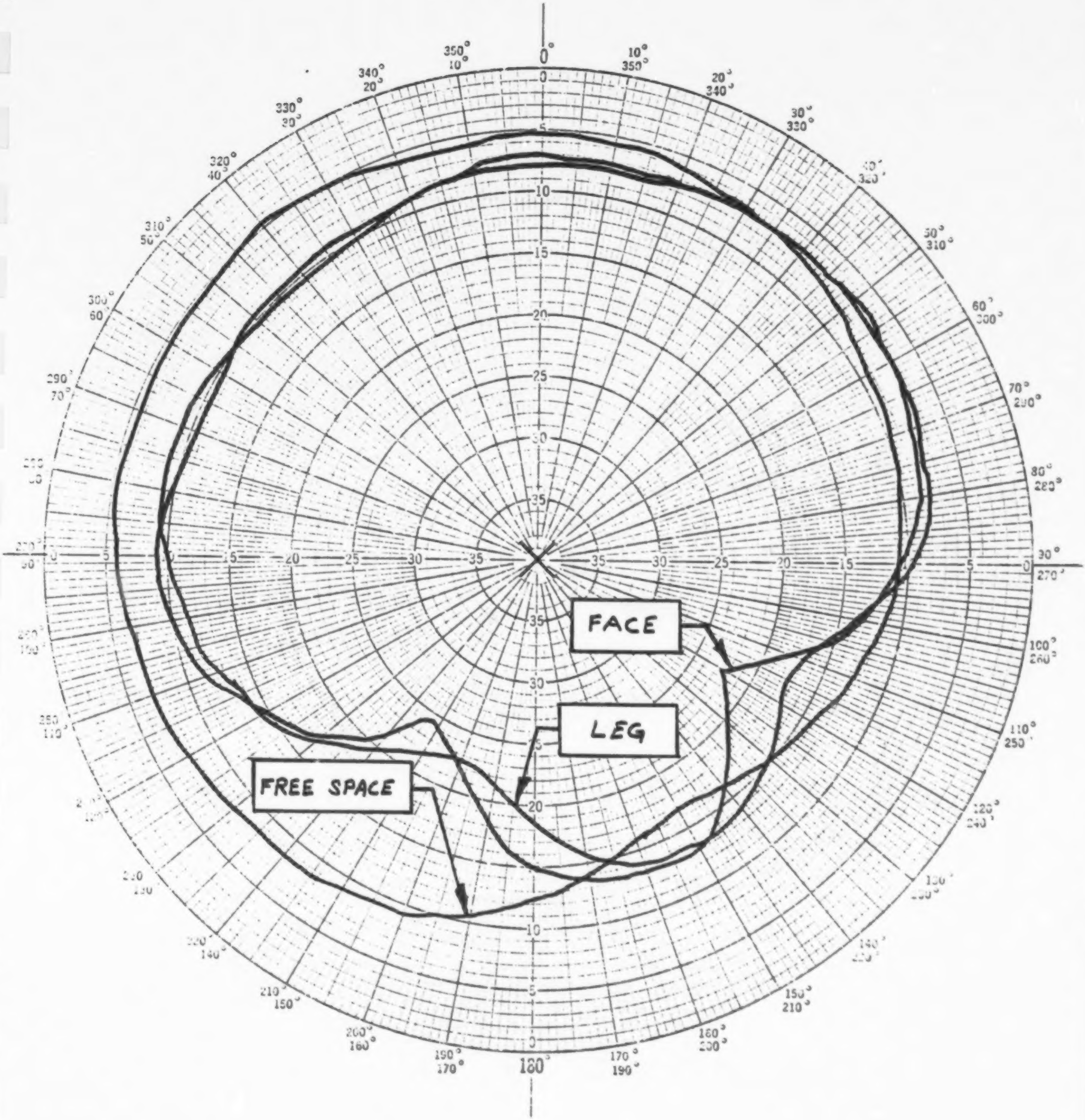
Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

17

# MODEL "-E-"
# AZIMUTH PATTERN
# HOZ. POLARIZED

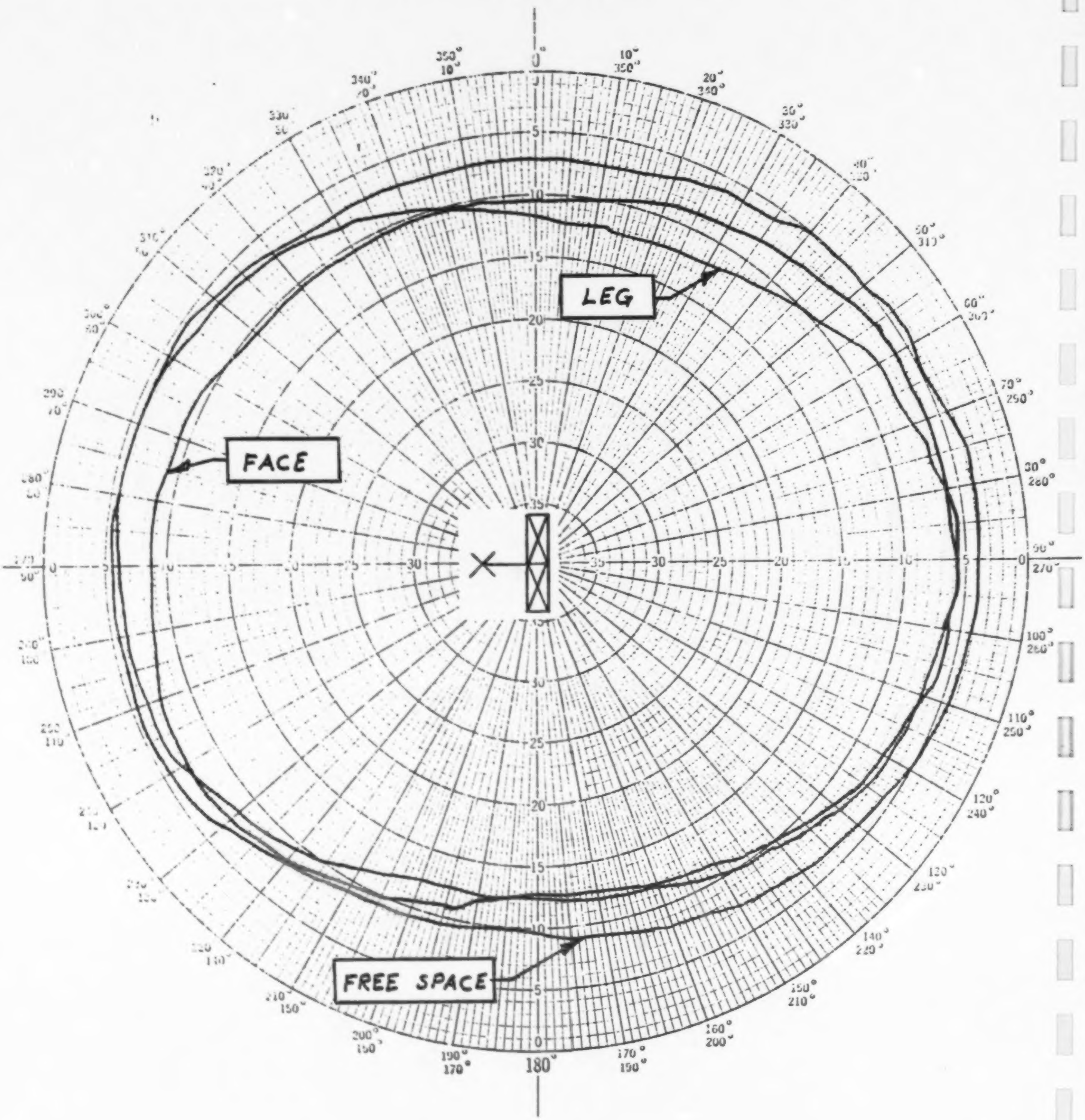


# MODEL "-E-"
# AZIMUTH PATTERN
# VERT. POLARIZED



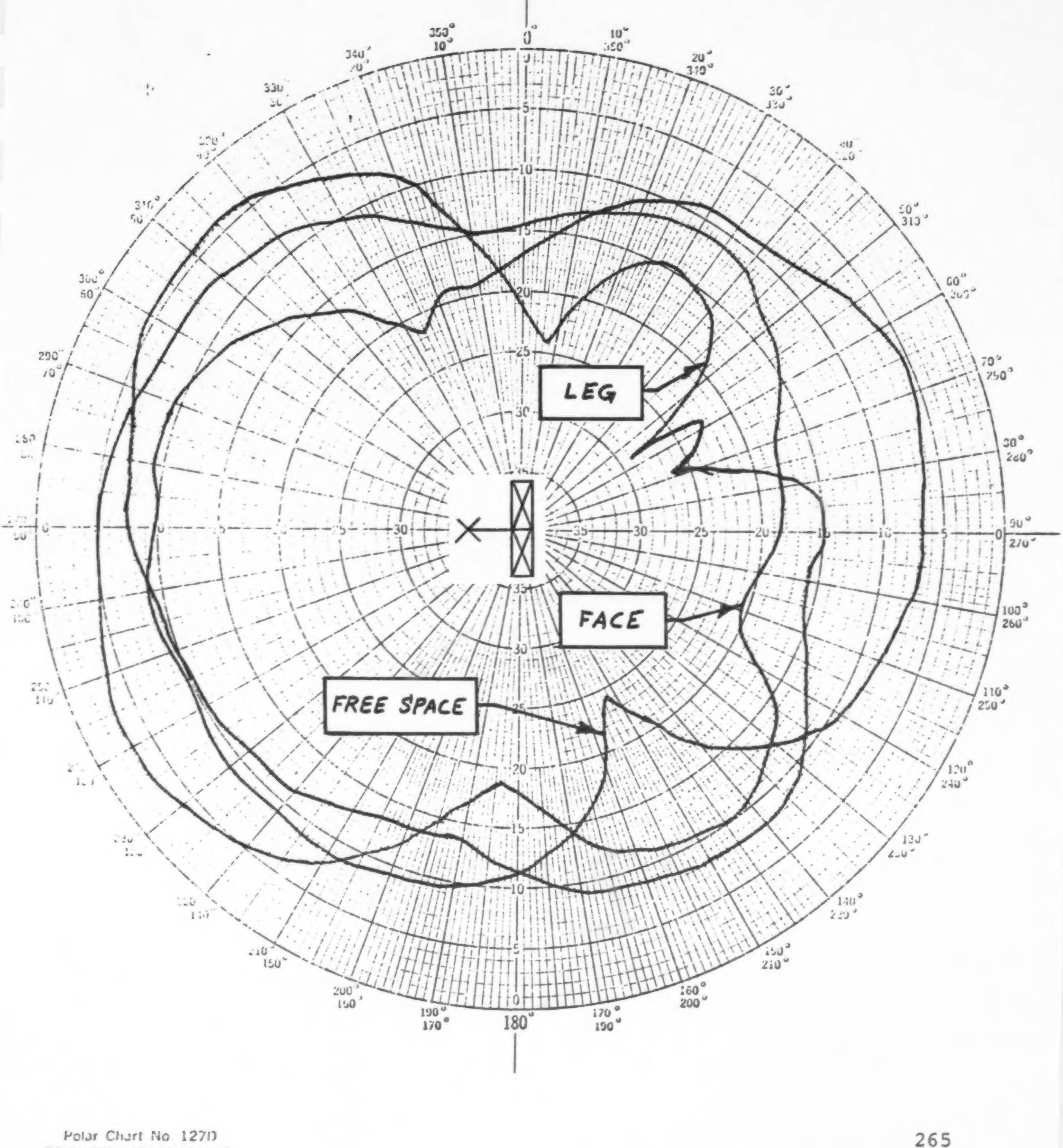
Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

MODEL "-E-"
ELEVATION PATTERN
0-180° CUT
HOZ. POLARIZED



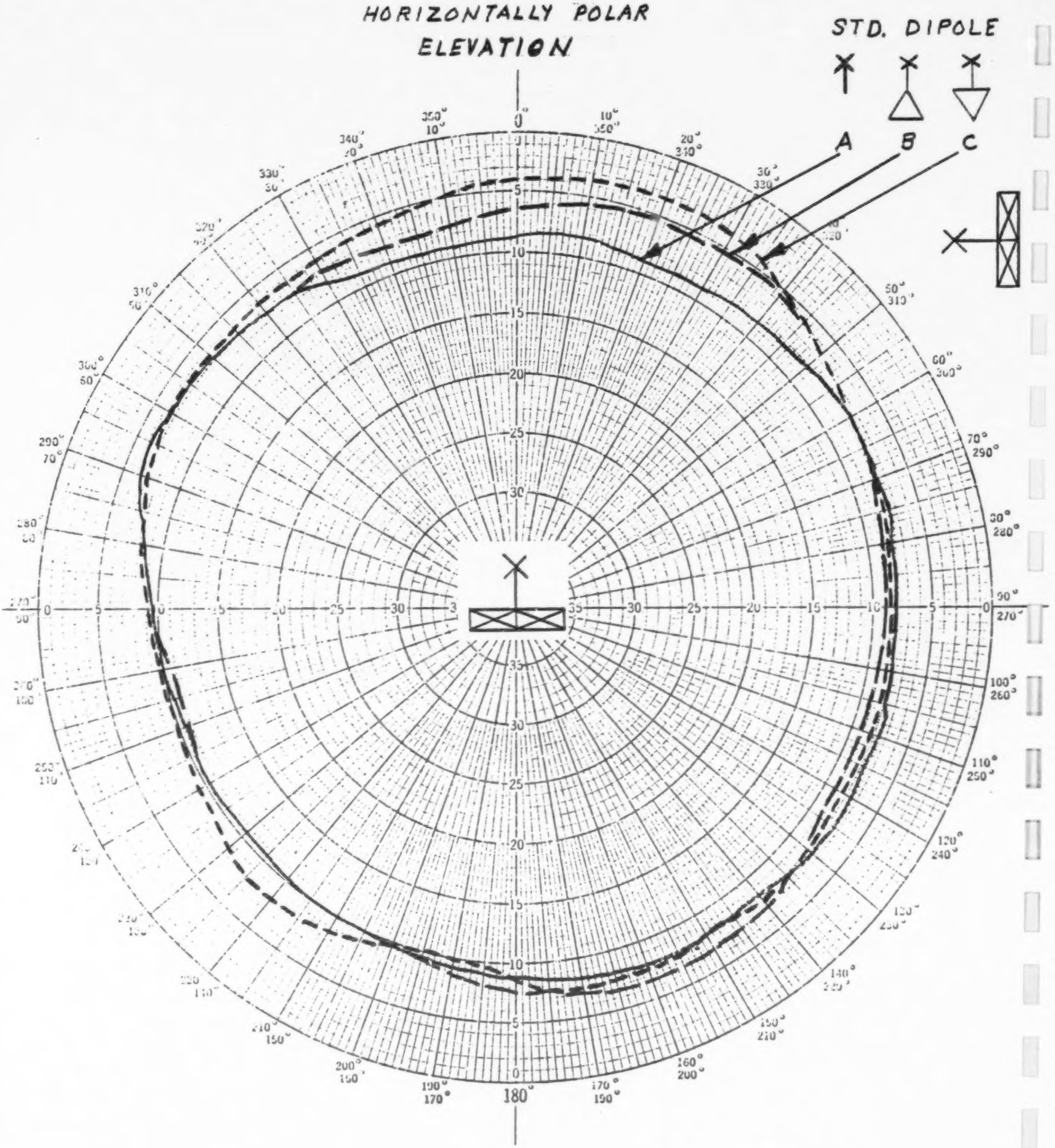
Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

# MODEL "-E-"
# ELEVATION PATTERN
# 0-180° CUT
# VERT. POLARIZED



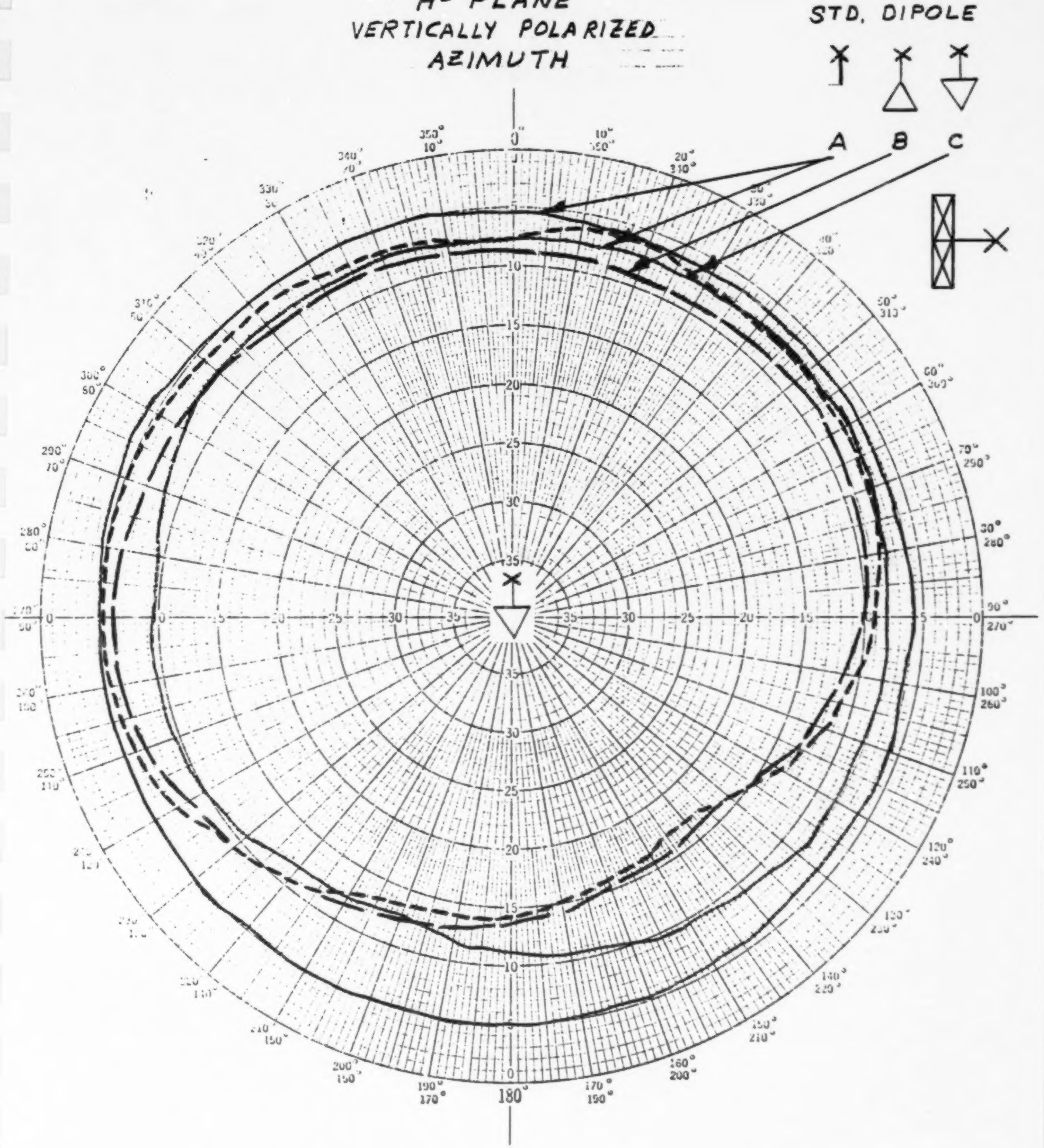
Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

MODEL "-F-"
H-PLANE
HORIZONTALLY POLAR
ELEVATION



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

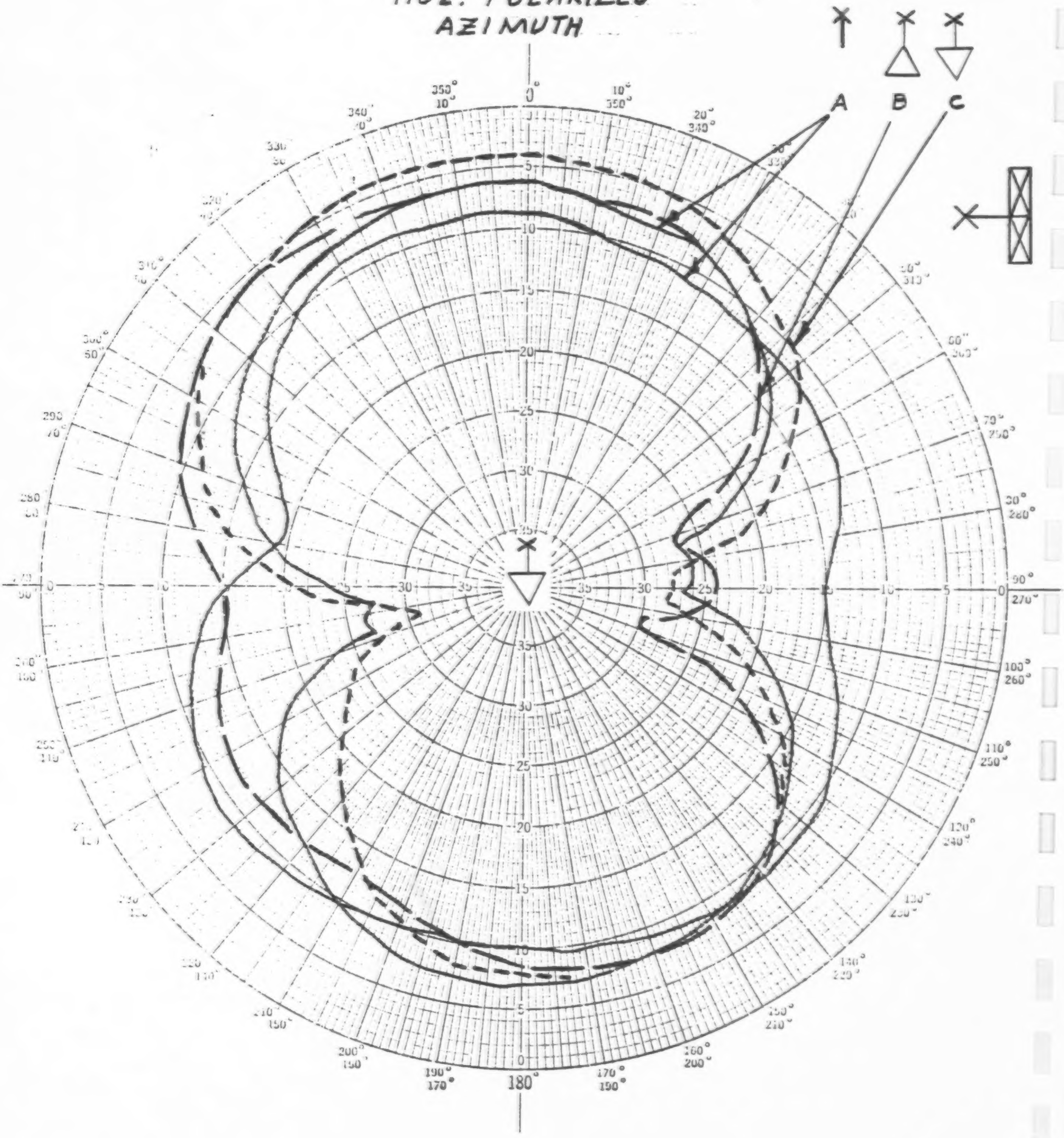
MODEL "F"
H- PLANE
VERTICALLY POLARIZED
AZIMUTH



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

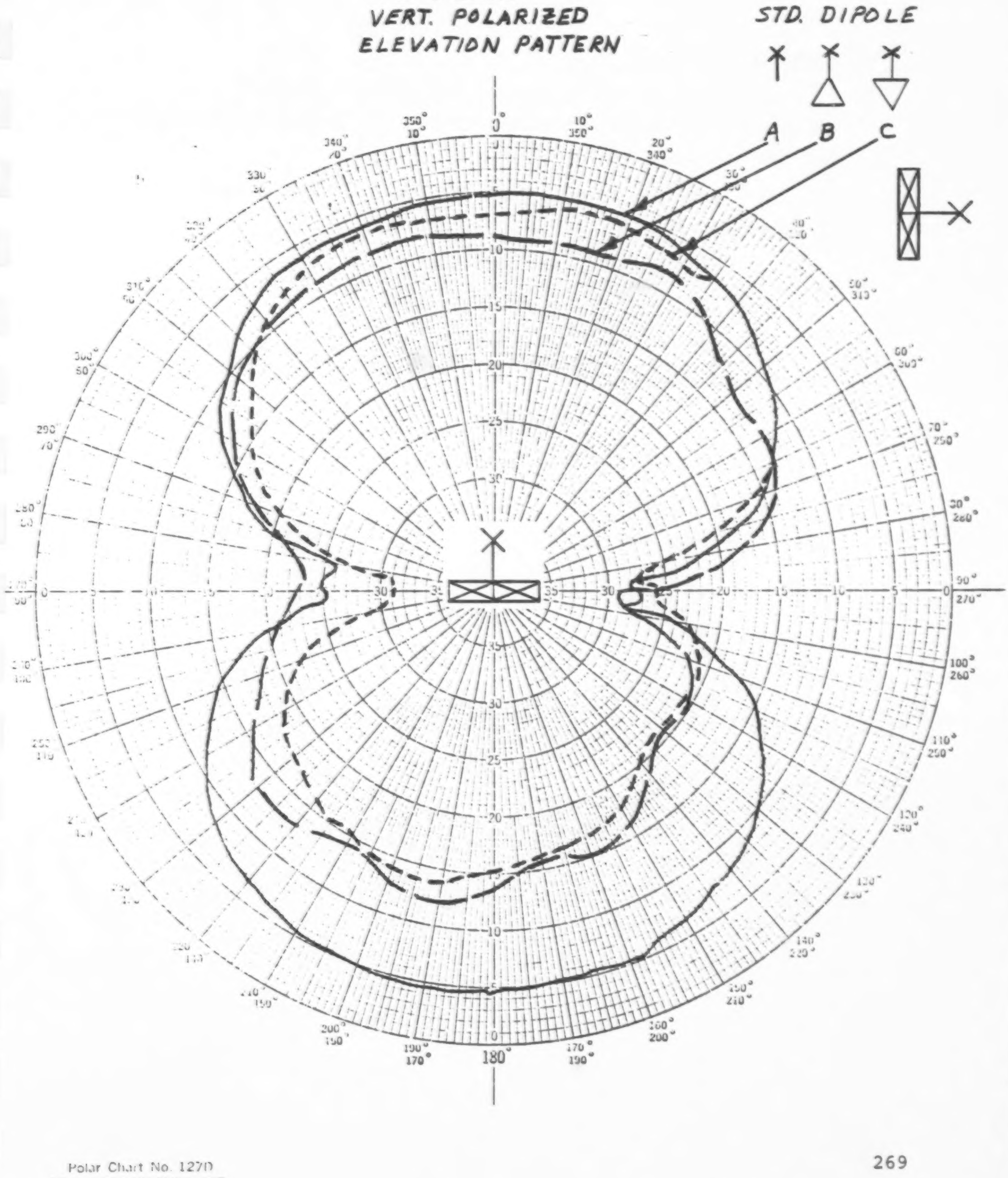
MODEL "-F-"
E-PLANE
HOZ. POLARIZED
AZIMUTH

STD. DIPOLE



Polar Chart No. 1270
SCIENTIFIC ATLANTA, INC.
ATLANTA, GEORGIA

MODEL "F"
E-PLANE
VERT. POLARIZED
ELEVATION PATTERN



Polar Chart No. 127D
SCIENTIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

## VI RANGE CALIBRATION

The pattern range was calibrated by taking E & H patterns of a standard gain dipole in the same position as the antennas that were tested.

We know the measured pattern of a standard gain dipole will be

(a) H-plane pattern is uniform

(b) E-plane pattern is cos(θ)

The multipath effects will tend to distort these. A measure of the distortion is a measure of the range errors.

The dipole was measured

(a) About a 4" axis

(b) About a 54" axis

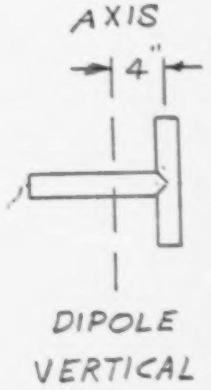
(c) About a 47½" axis on the face of the tower

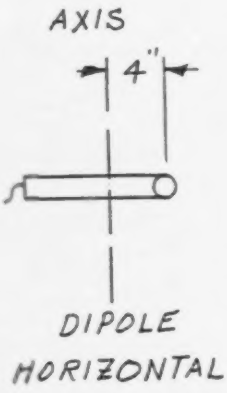
(d) About a 64½" axis on the leg of the tower

MODEL "F"
FREE SPACE MEASUREMENTS
RANGE CALIBRATION
Radius 4"
August 12, 1981

| PATTERN NUMBER * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | DIPOLE ORIENTATION | REMARKS |
|---|---|---|---|---|
| FFS1 (272) | 28.5 | H-Plane | Hoz. | |
| FFS2 (273) | 19.0 | H-Plane | Hoz. | |
| FFS3 (274) | 9.0 | H-Plane | Hoz. | |
| FFS4 (275) | 9.0 | E-Plane | Hoz. | |
| FFS5 (276) | 19.0 | E-Plane | Hoz. | |
| FFS6 (277) | 19.0 | E-Plane | Hoz. | |
| FFS7 (278) | 28.5 | E-Plane | Hoz. | |
| FFS8 (279) | 28.5 | E-Plane | Hoz. | |
| FFS9 (280) | 19.0 | E-Plane | Hoz. | |
| FFS10 (281) | 19.0 | H-Plane | Hoz. | |
| FFS11 (282) | 28.5 | H-Plane | Hoz. | |
| FFS12 (283) | 28.5 | H-Plane | Hoz. | |
| FFS13 (284) | 28.5 | H-Plane | Vert. | |
| FFS15 (285) | 28.5 | E-Plane | Vert. | |
| FFS16 (286) | 28.5 | E-Plane | Vert. | |
| FFS17 (287) | 28.5 | E-Plane | Hoz. | |
| FFS18 (288) | 28.5 | E-Plane | Hoz. | |
| FFS19 (289) | 28.5 | E-Plane | Hoz. | |
| FFS20 (290) | 28.5 | H-Plane | Hoz. | |
| FFS21 (281) | 19.0 | E/H Plane | Hoz. | |
| FFS22 (282) | 19.0 | E-Plane | Hoz. | |

*Page Numbers



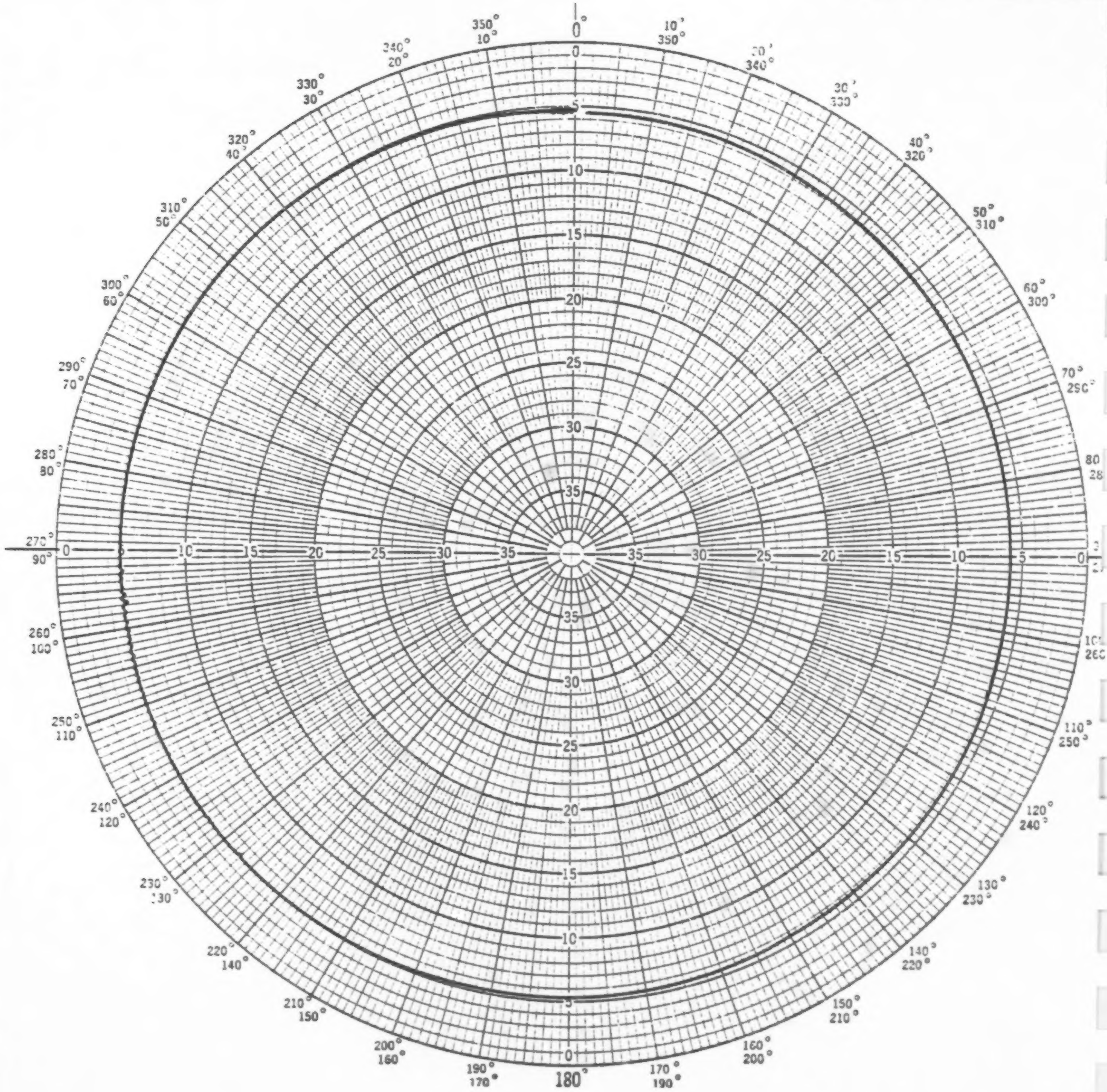


**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS1



PATTERN: H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

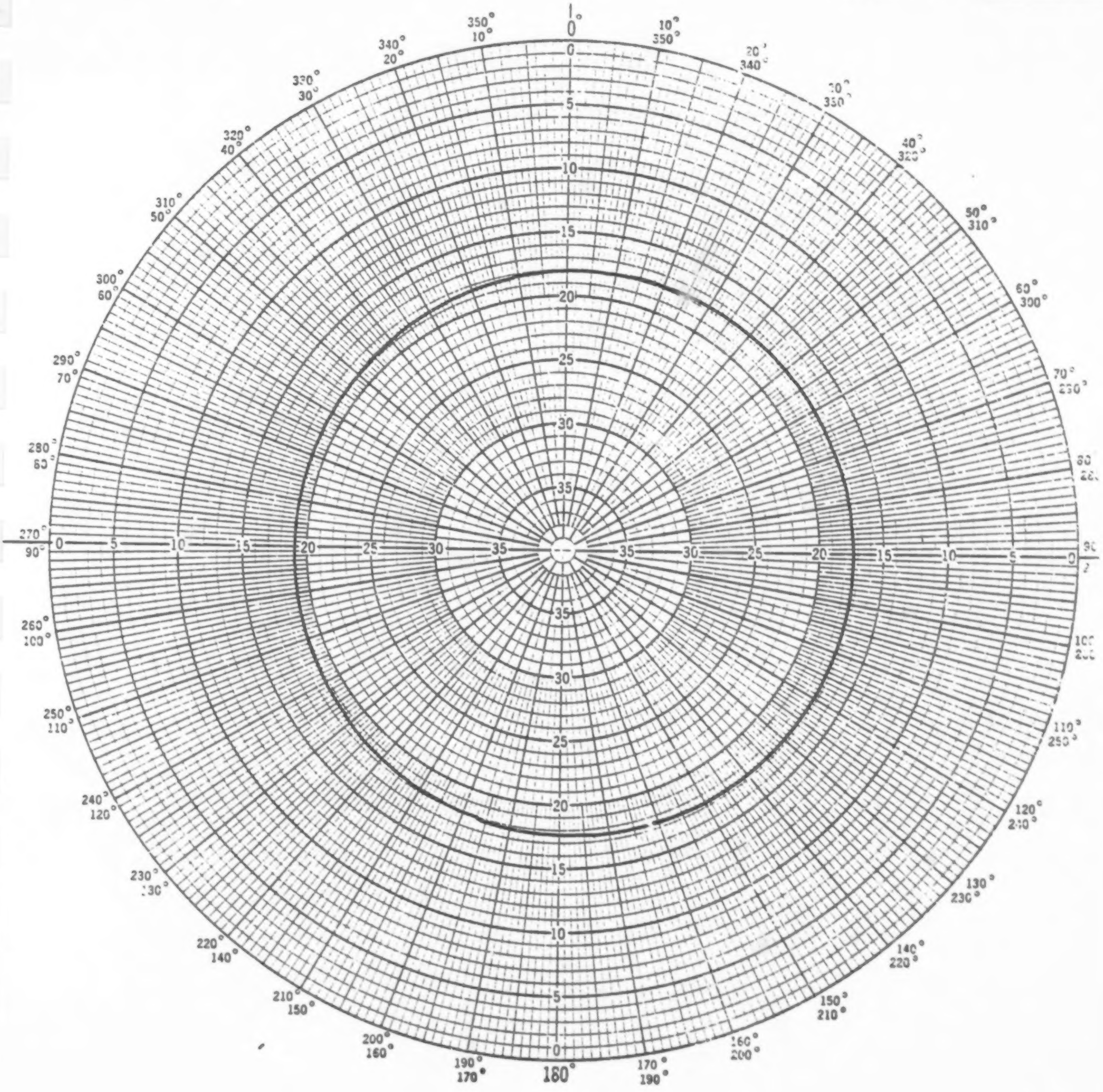
RING RADIUS: 4"

Micro
Communications
Inc.

DATE: 8/12/8.

MODEL: F

PATTERN NO.: FFS2



PATTERN: H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

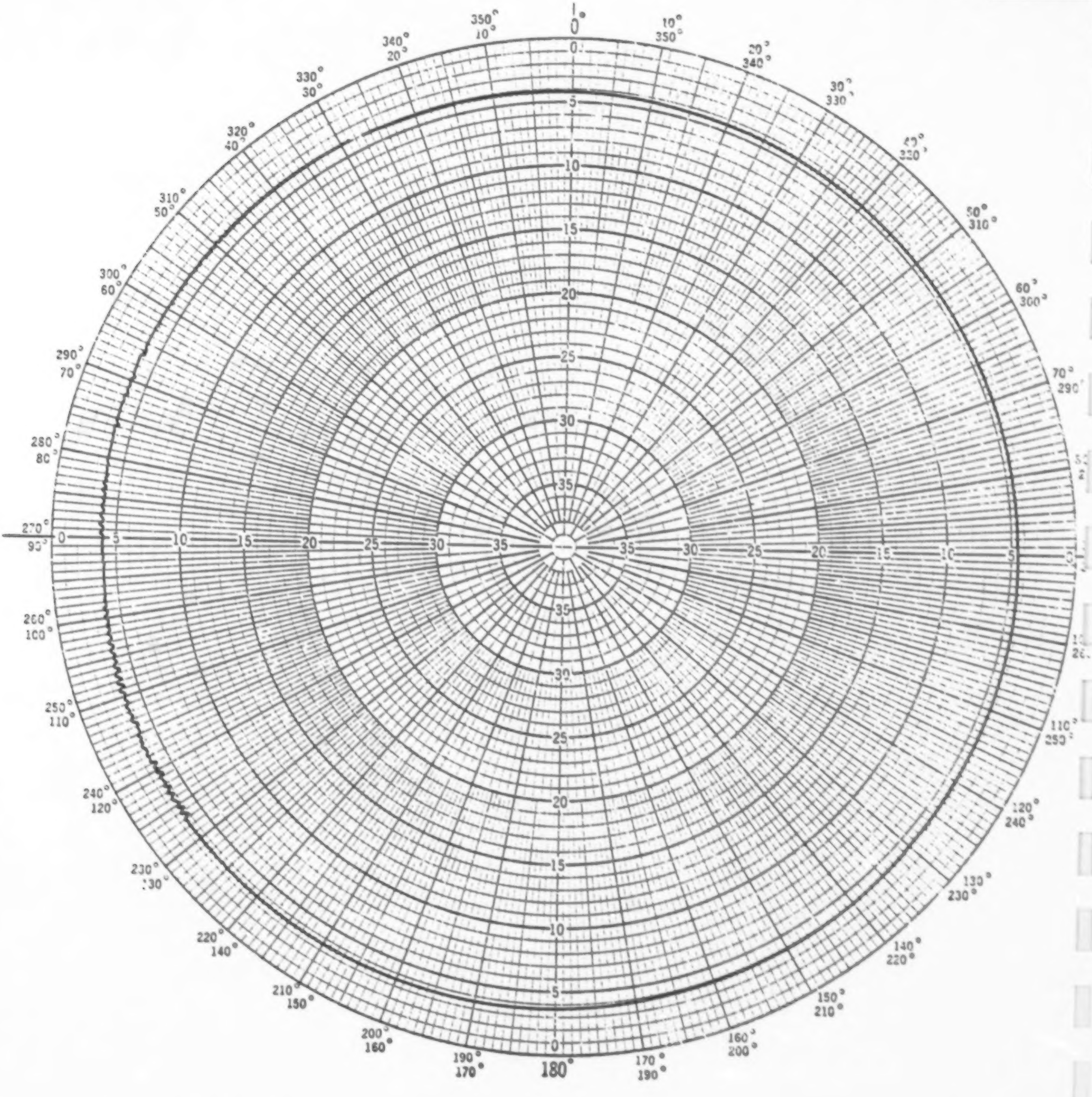
RING RADIUS: 4"

Micro
Communications
Inc.

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS3



PATTERN: H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 9 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

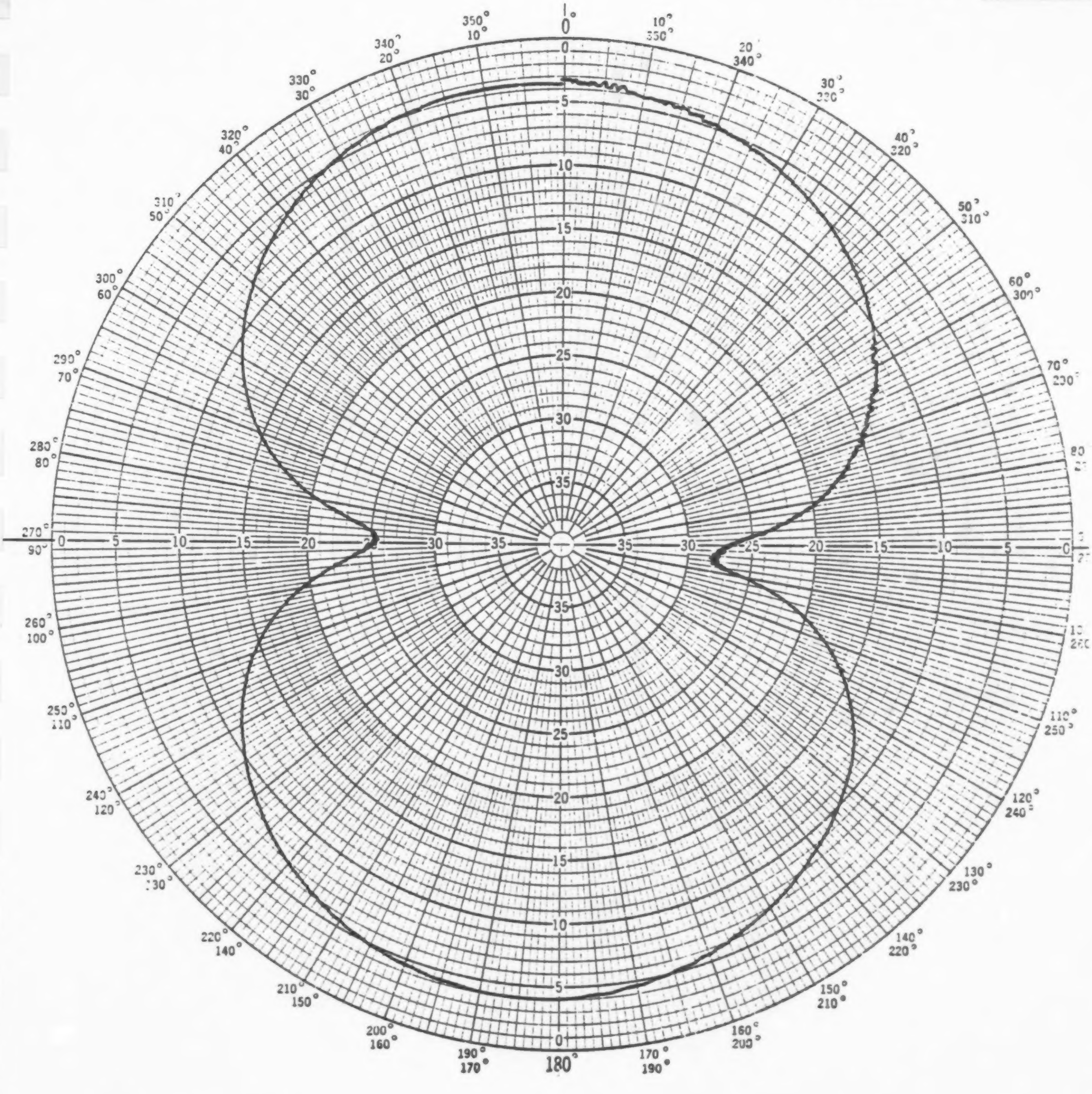
RING RADIUS: 4"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS4



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 9 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

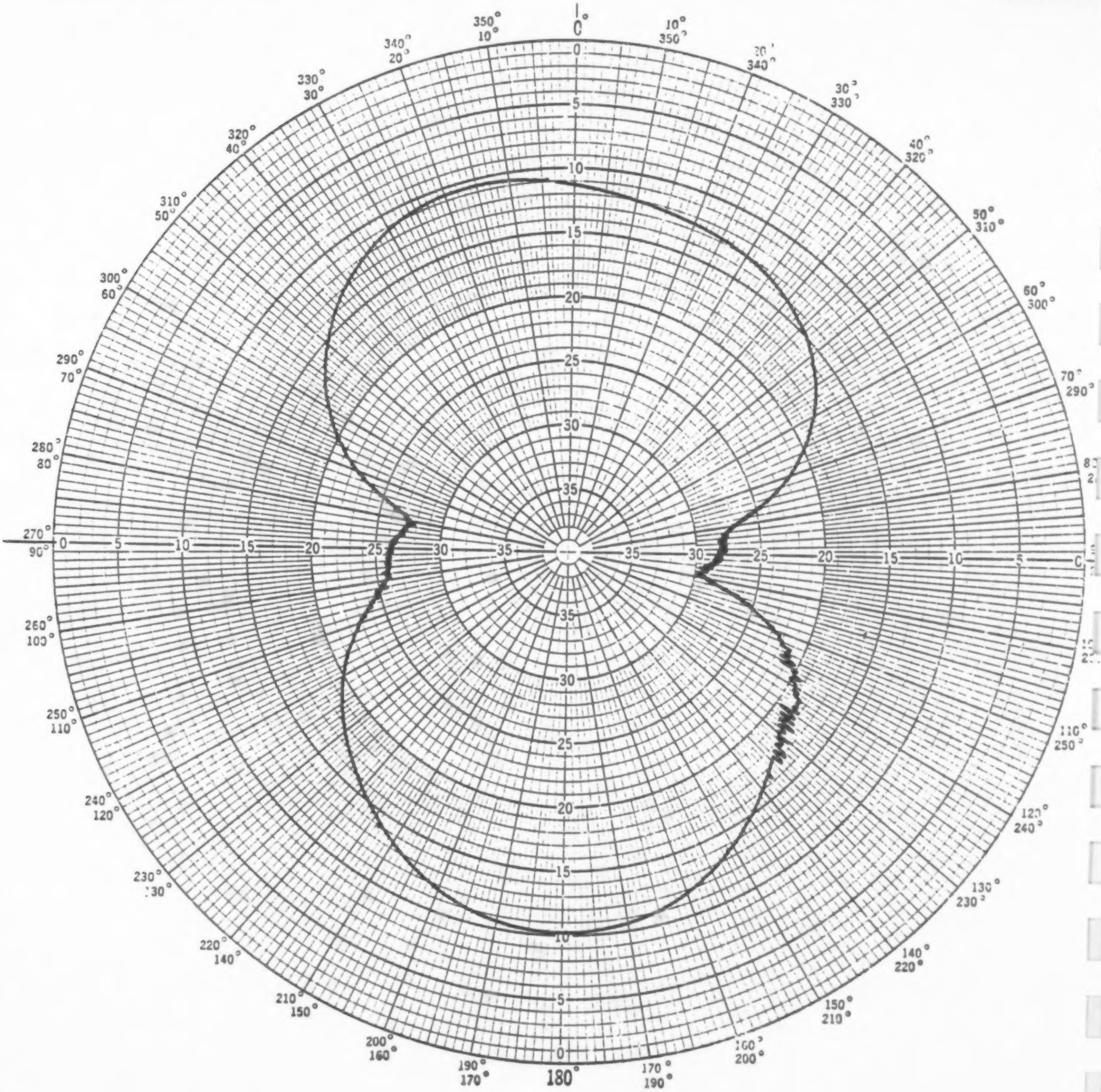
RING RADIUS: 4"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS5



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

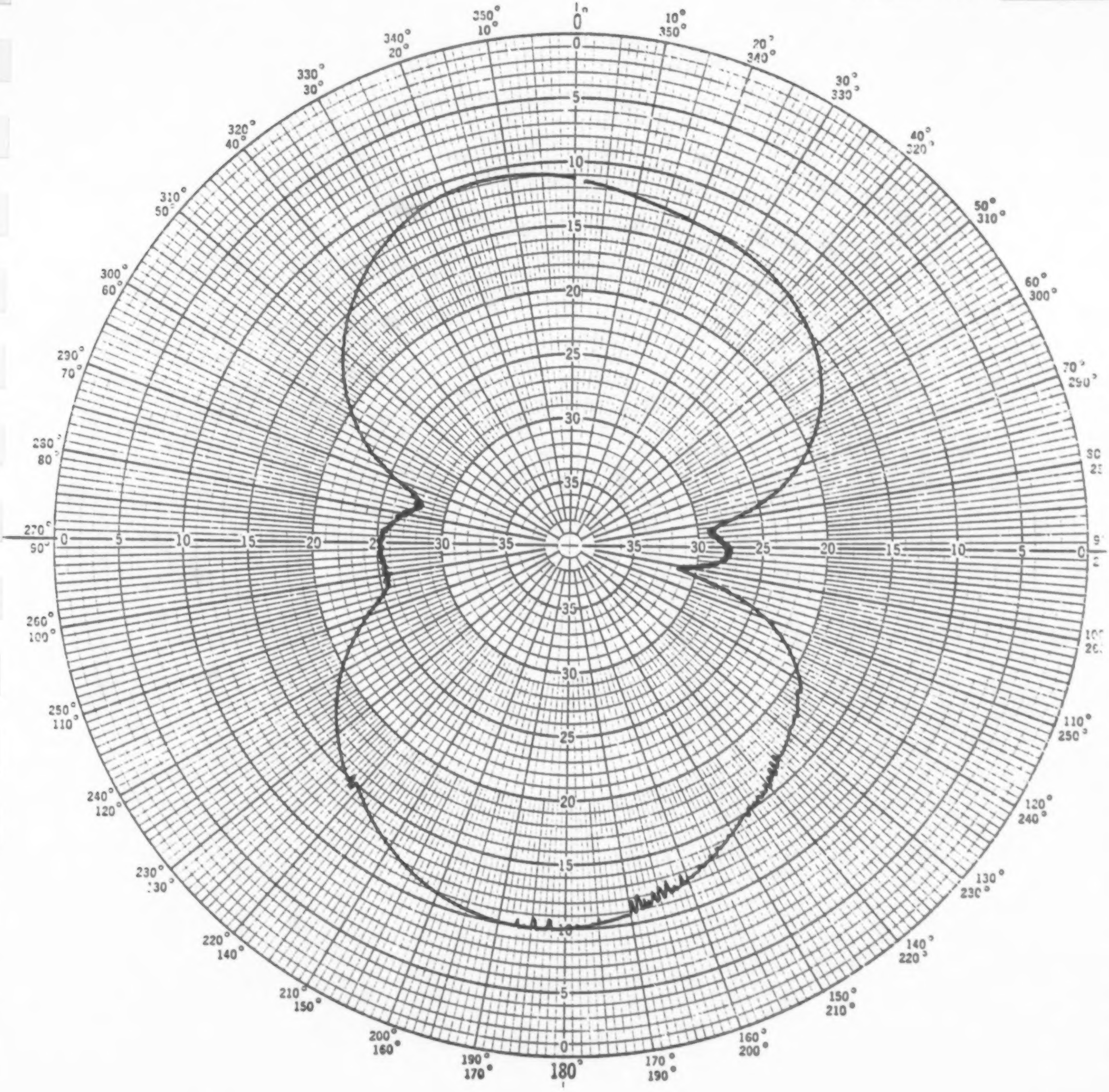
RING RADIUS: 4"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS6



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

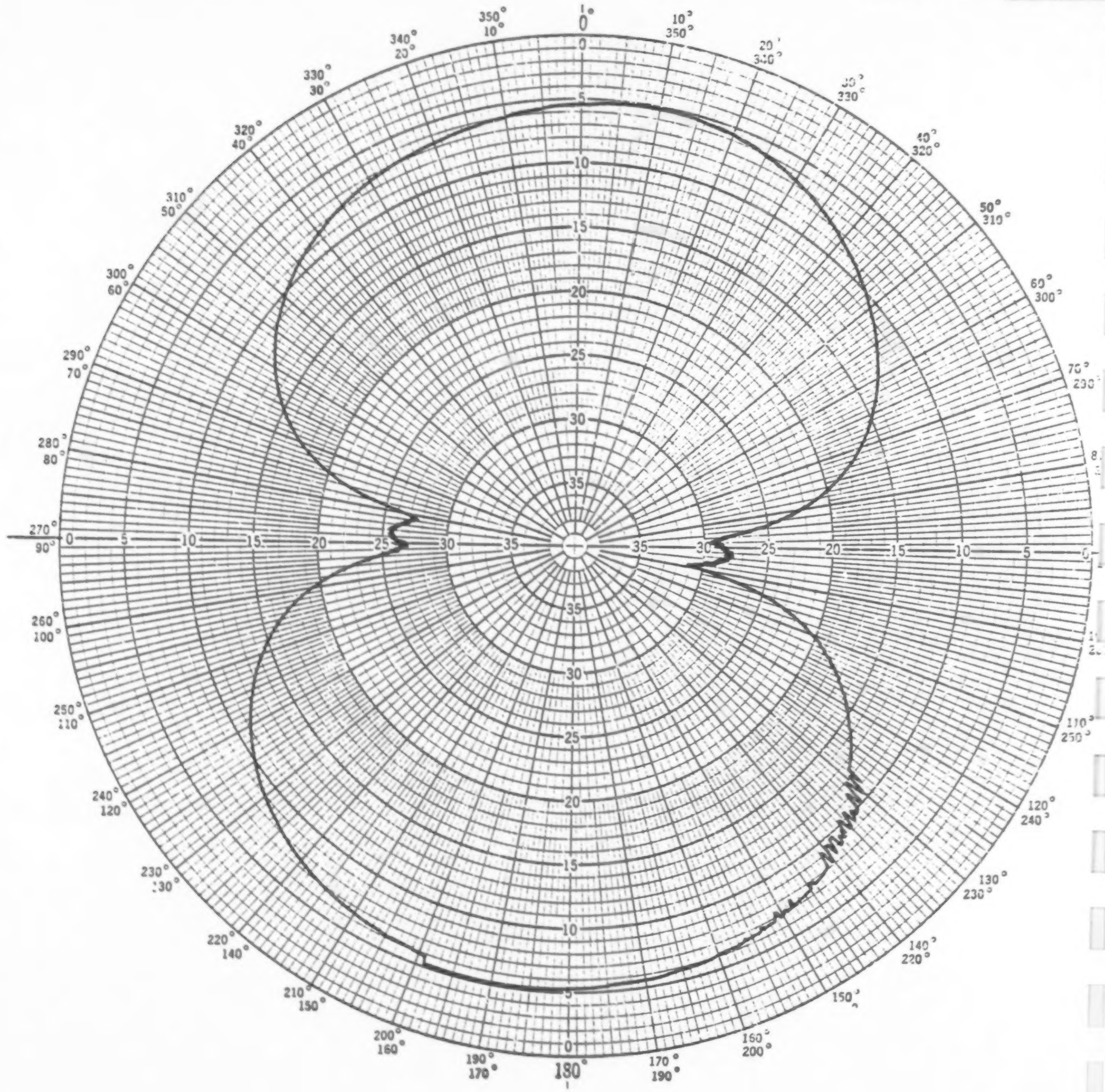
RING RADIUS: 4"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS7



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTIN
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT
TO TEST ANT.: 131 FT.

RING RADIUS: 4"

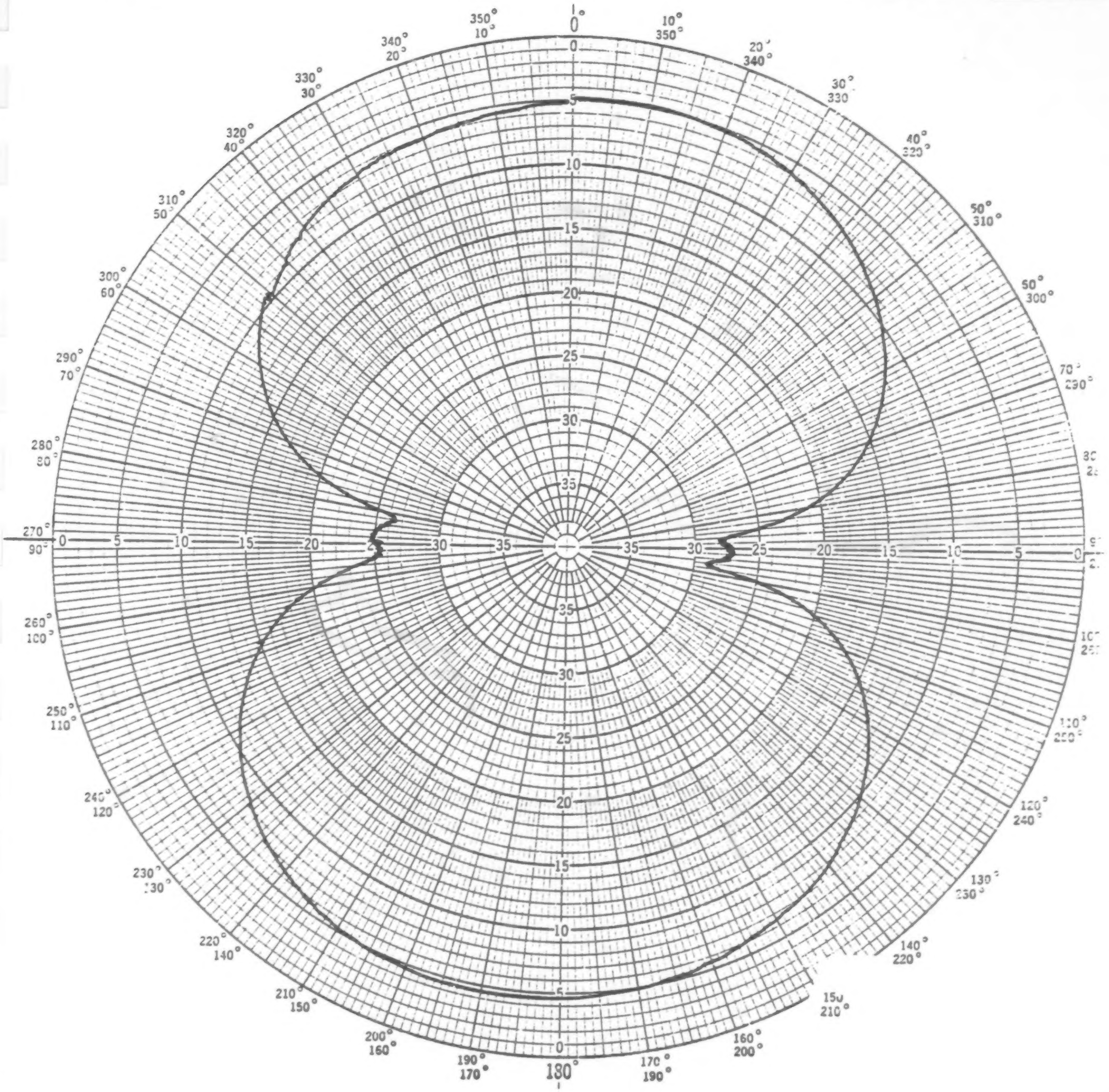
MCi

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS8



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

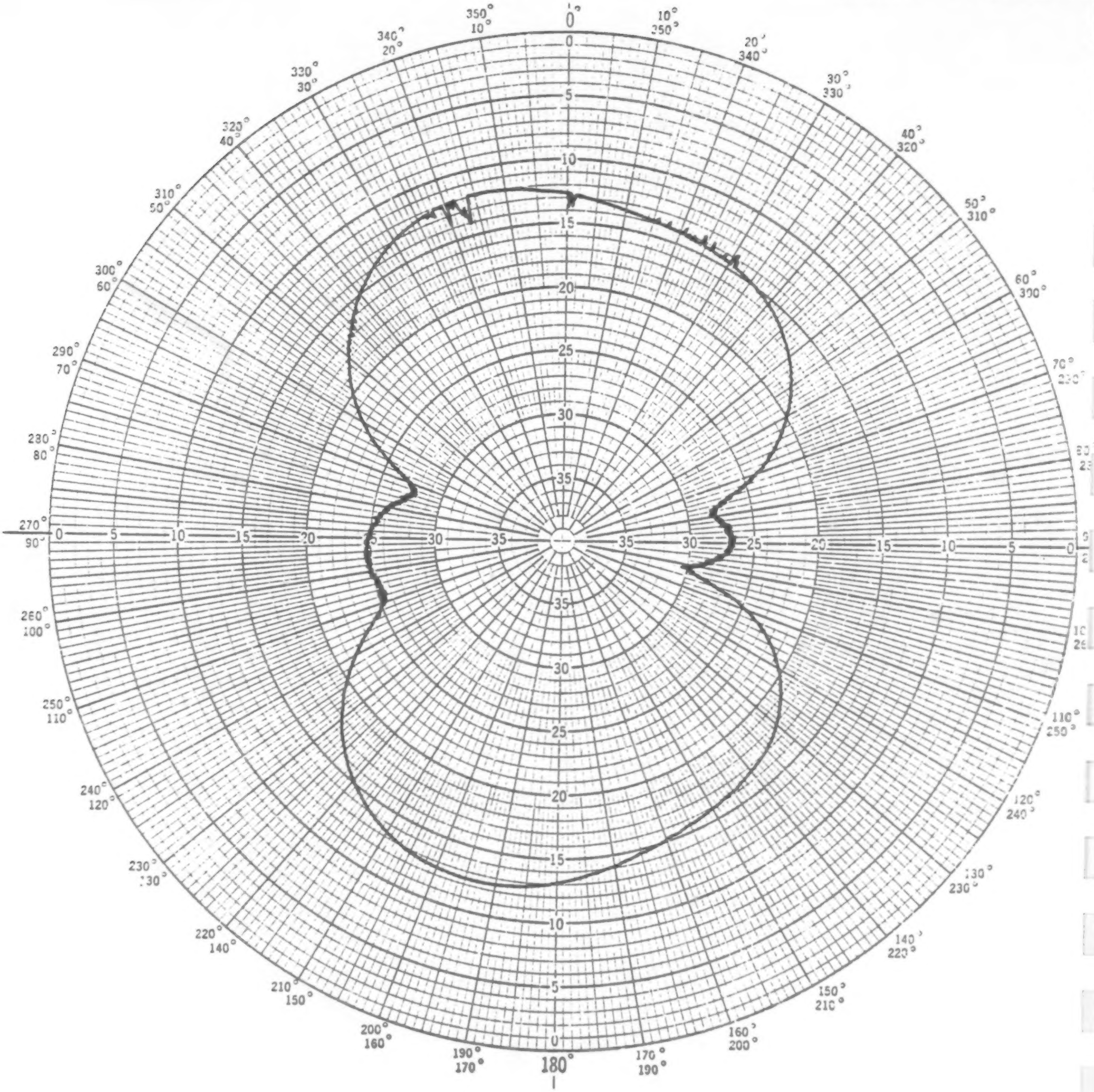
RING RADIUS: 4"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS9



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

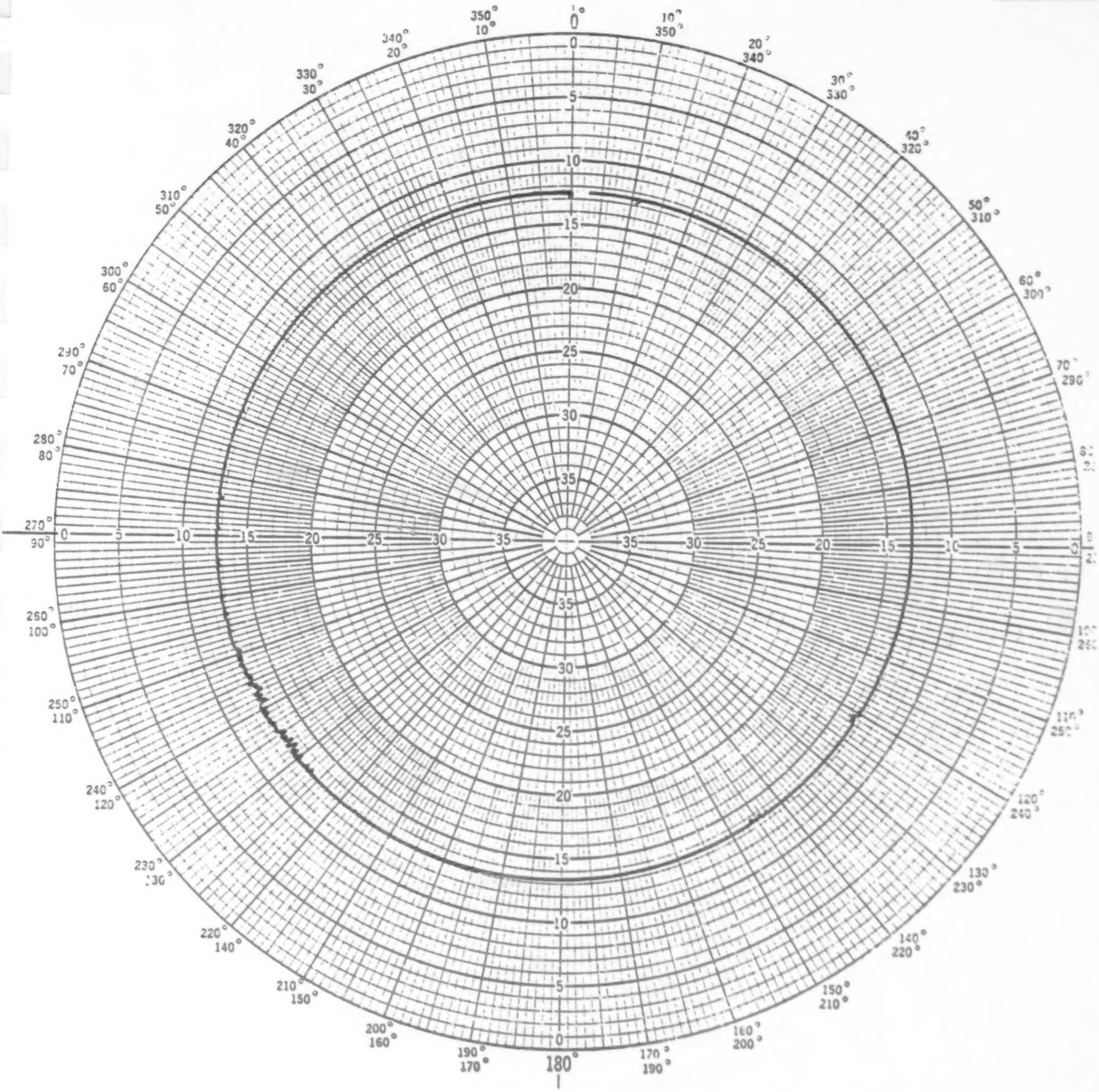
RING RADIUS: 4"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS10



PATTERN: H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

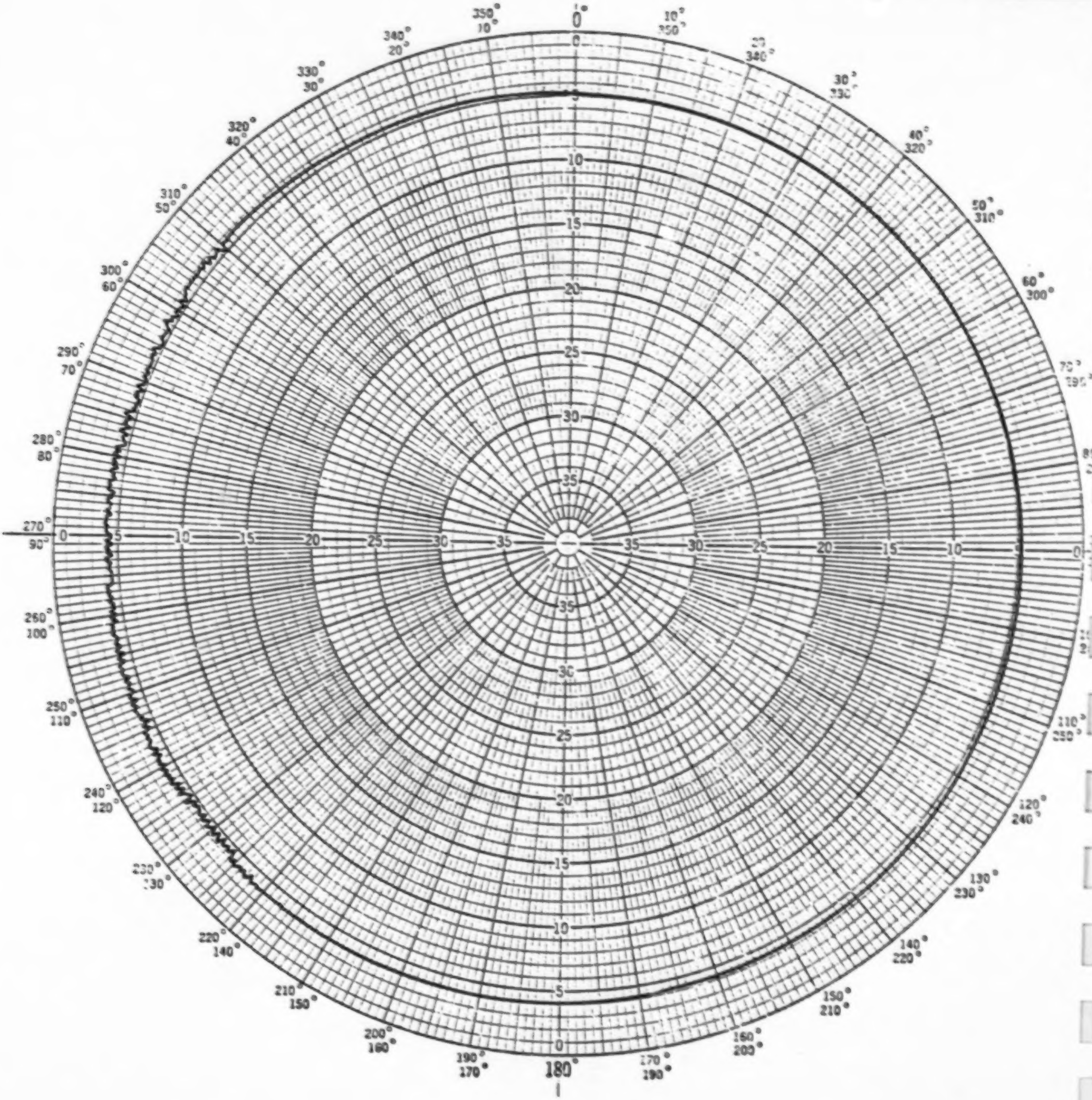
RING RADIUS: 4"

Micro Communications Inc.

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS11



PATTERN: H-PLANE

ANTENNA LOCATION ON TOWER: FREE SPACE

TRANSMITTING ANTENNA POLARIZATION: VERT.

HEIGHT OF TRANSMITTING ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

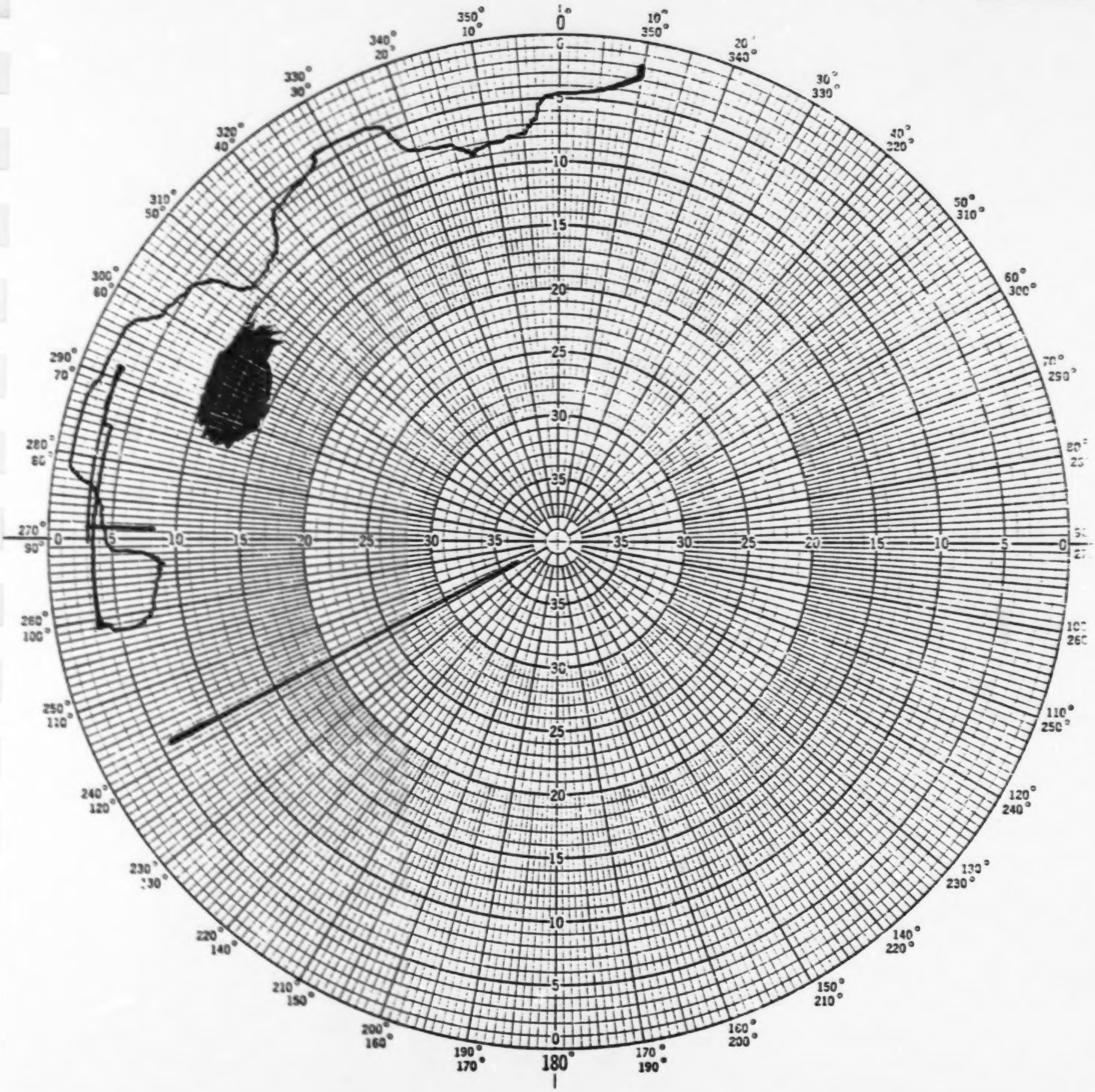
RING RADIUS: 4"

**MCi** Micro Communications Inc.

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS12



PATTERN: H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: ______

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

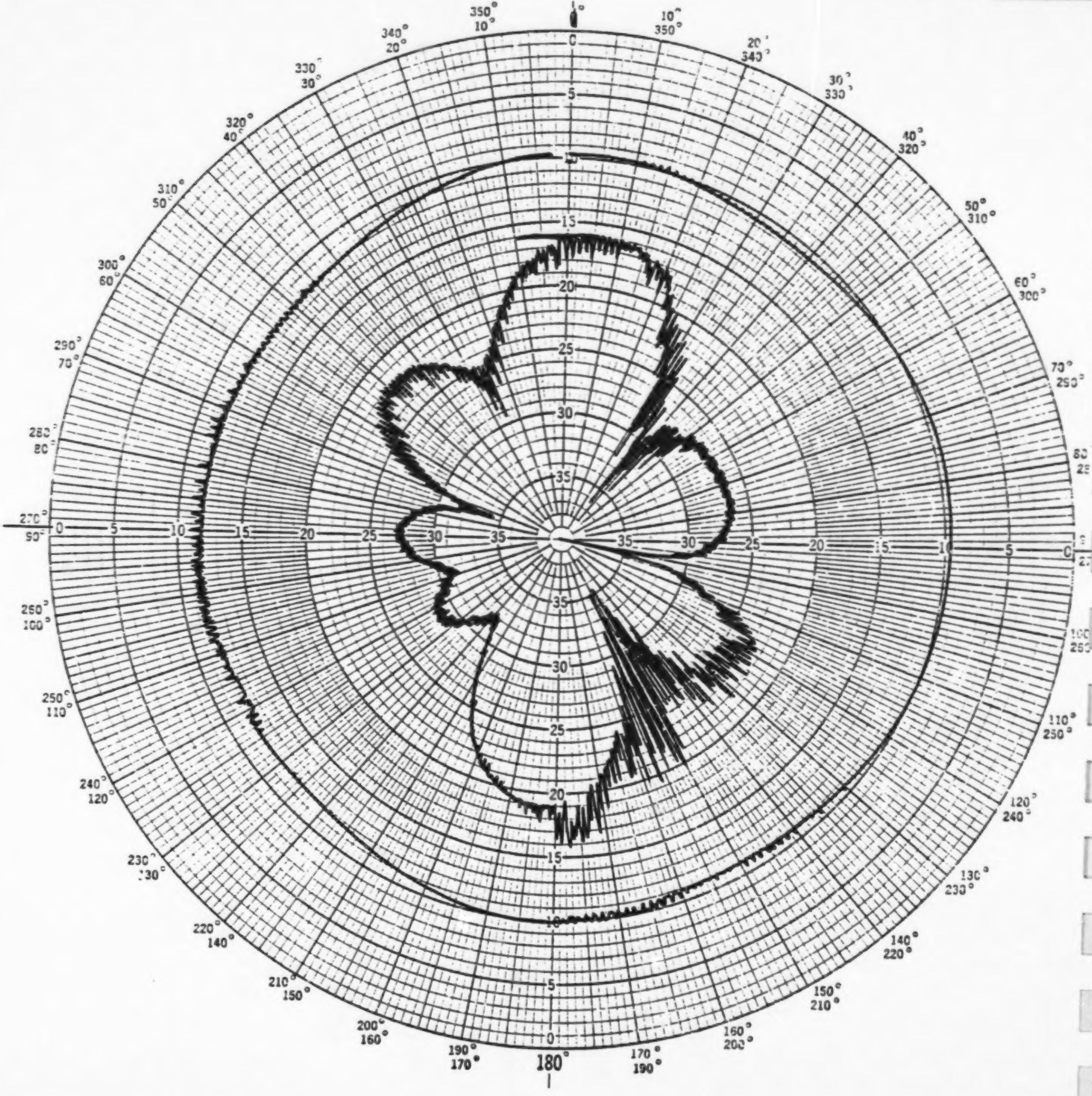
RING RADIUS: 4"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS13



PATTERN: H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

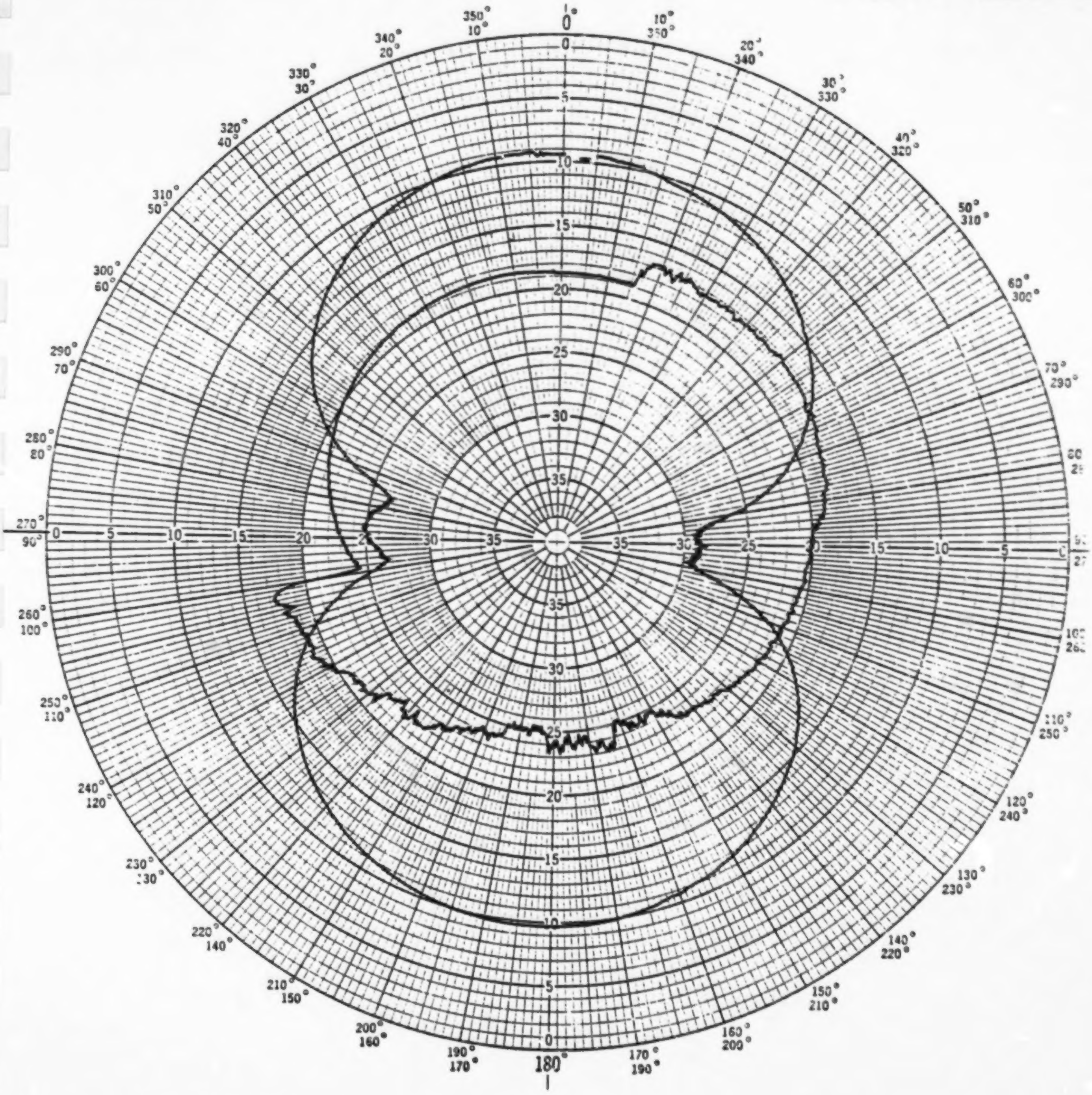
RING RADIUS: 4"

MCi **Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: EFS15



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

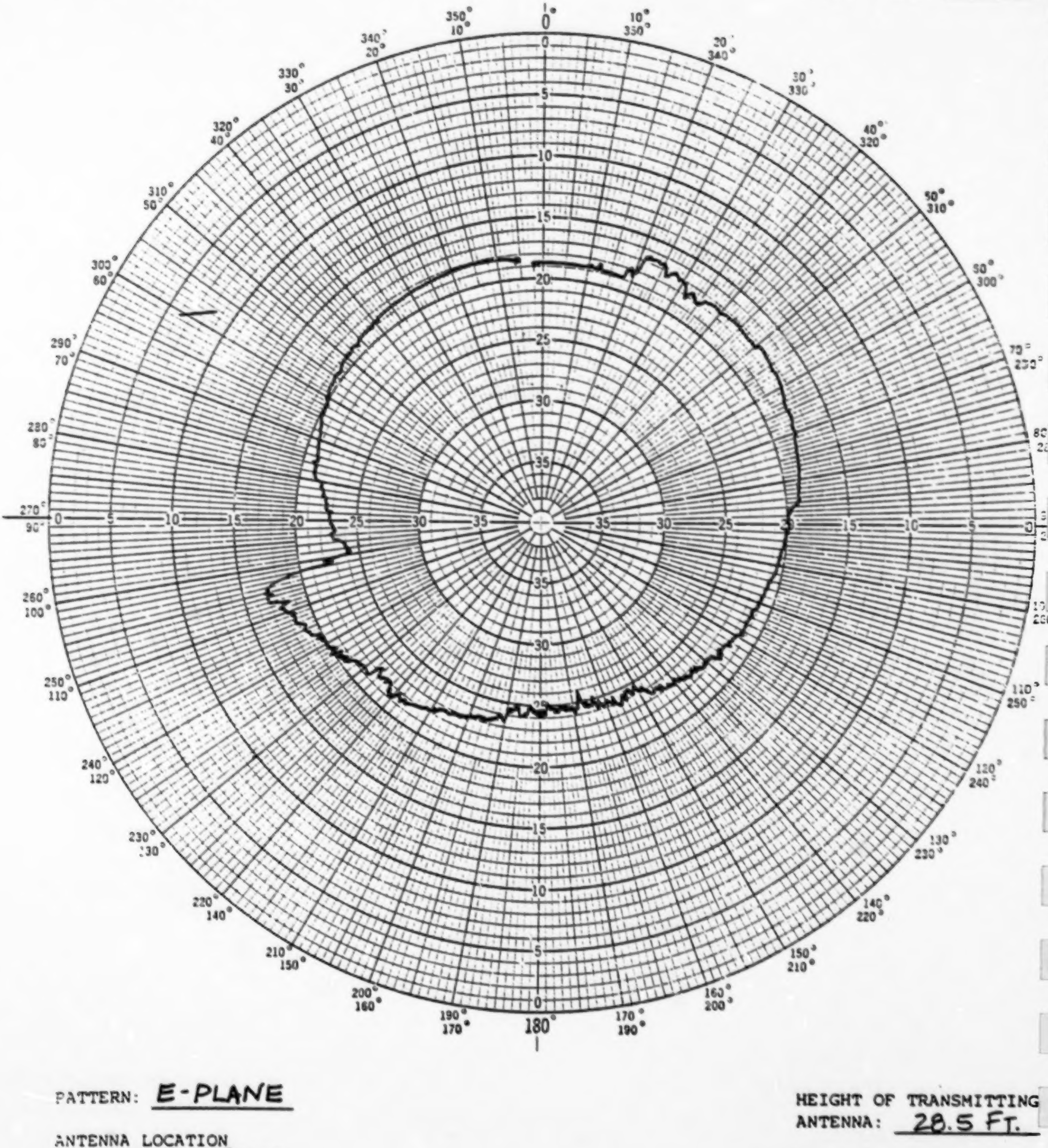
RING RADIUS: 4"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS16



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

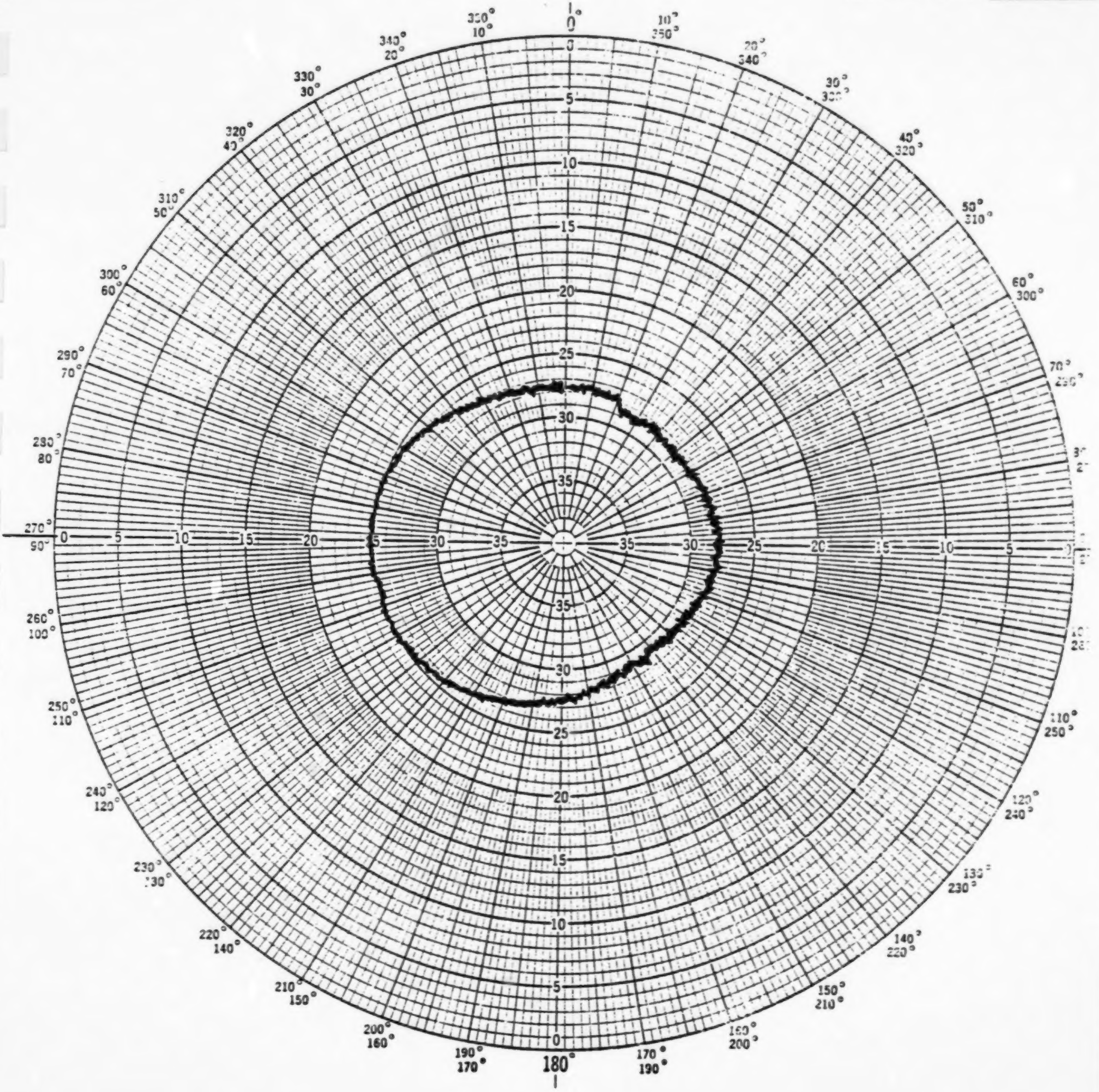
RING RADIUS: 4"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS17



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

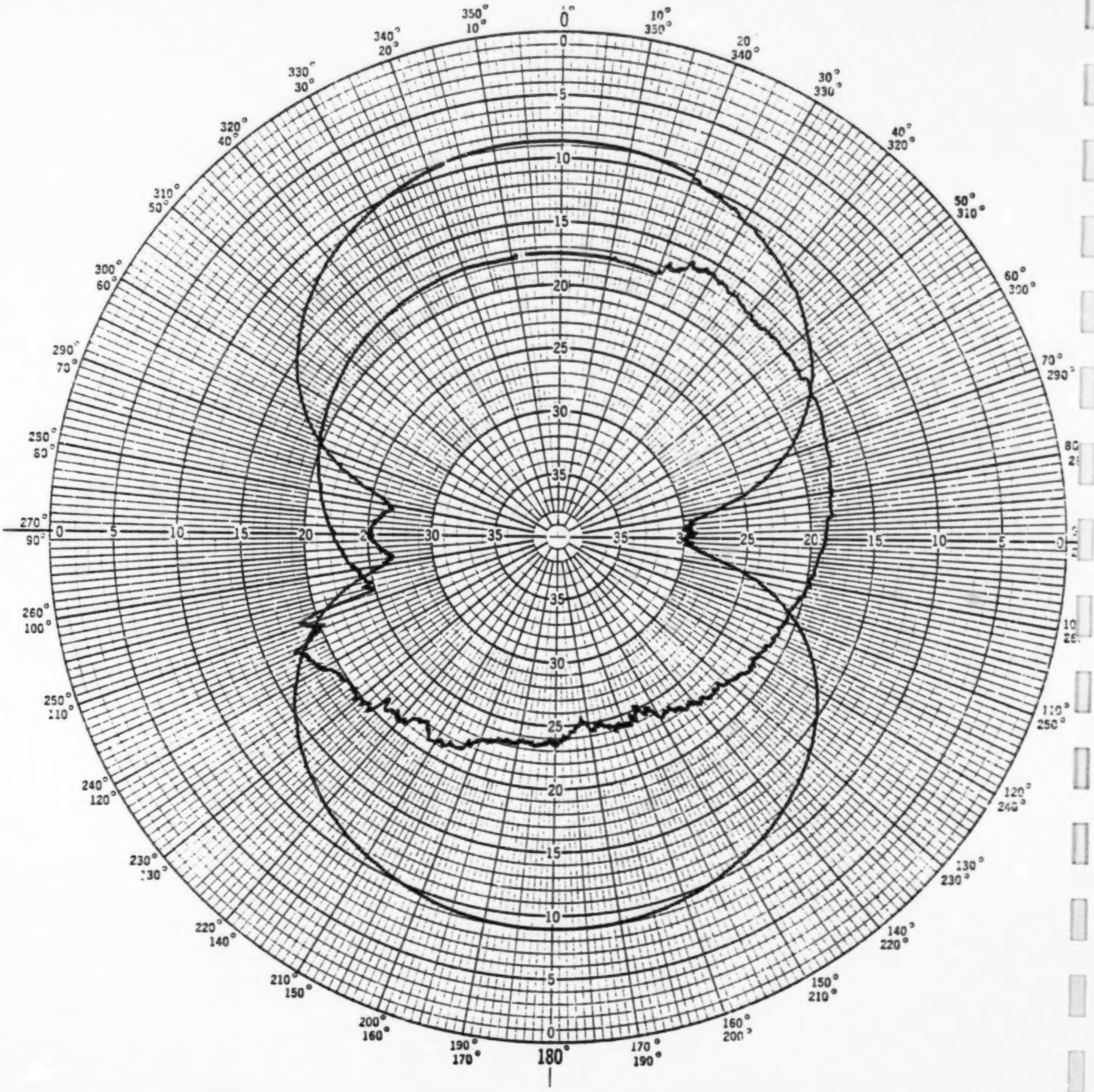
RING RADIUS: 4"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS18



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.

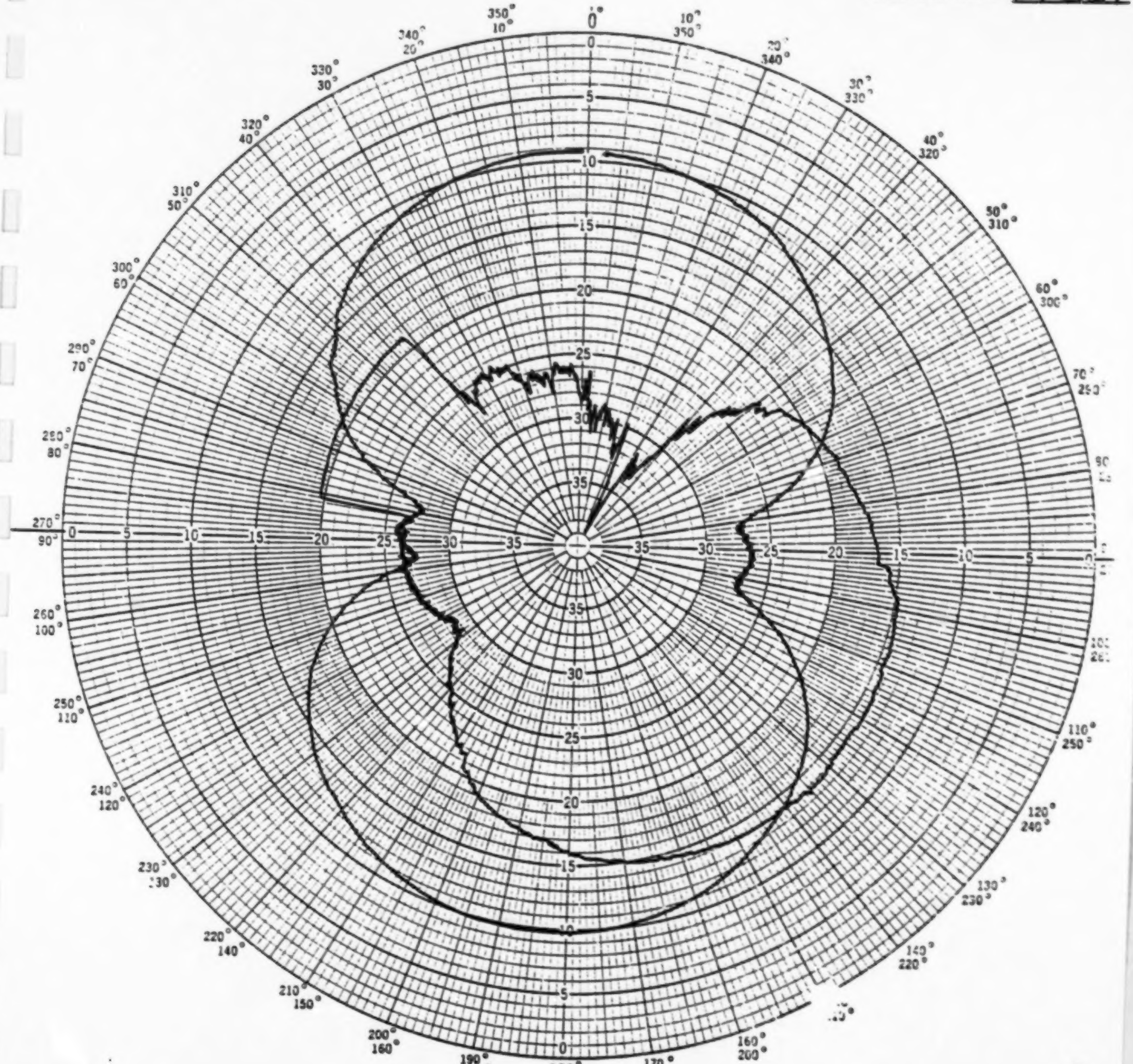
HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 4"

Micro
Communications
Inc.

DATE: 8/12/81
MODEL: F
PATTERN NO.: FFS19



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

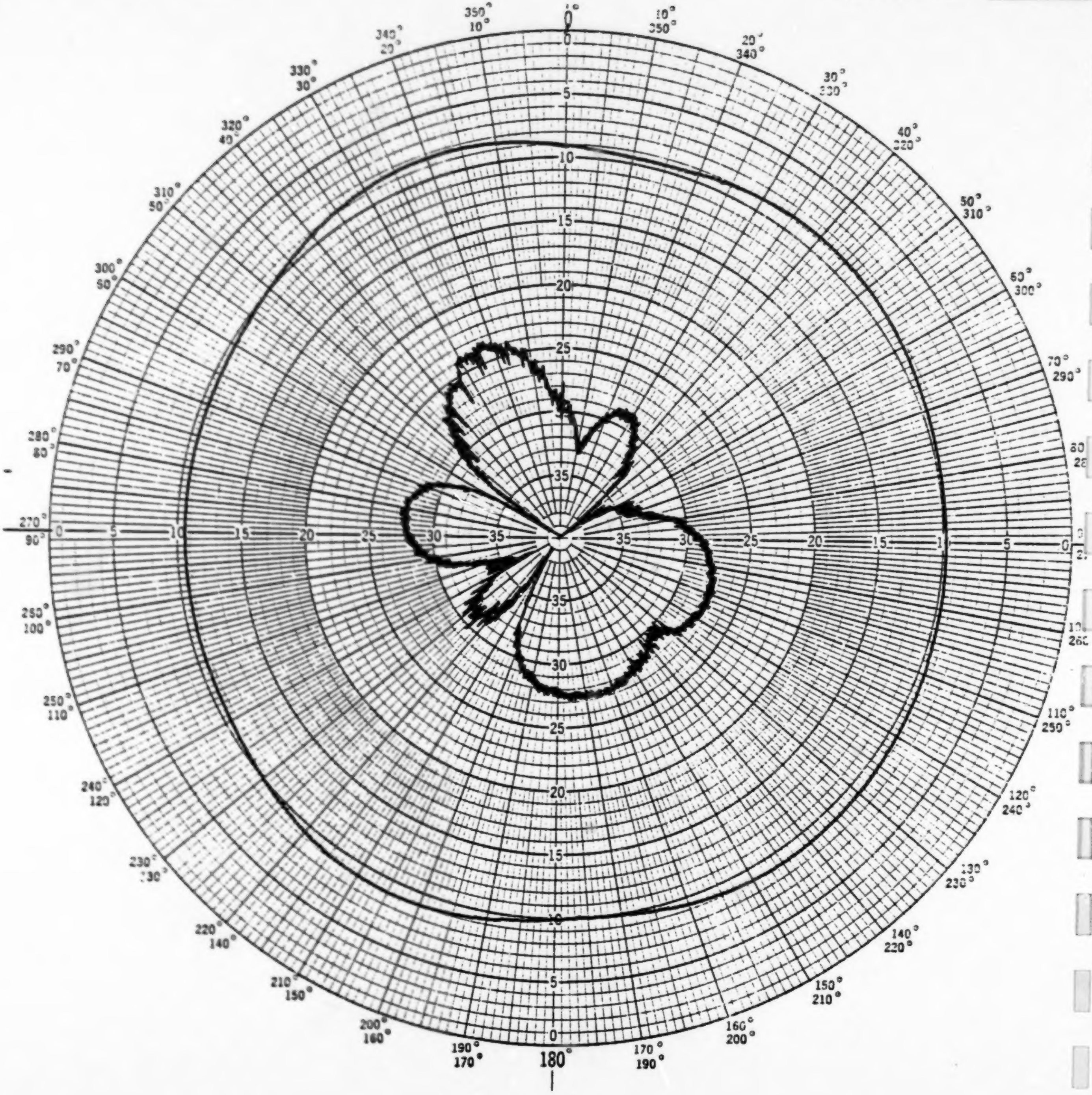
RING RADIUS: 4"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS20



PATTERN: H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 28.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

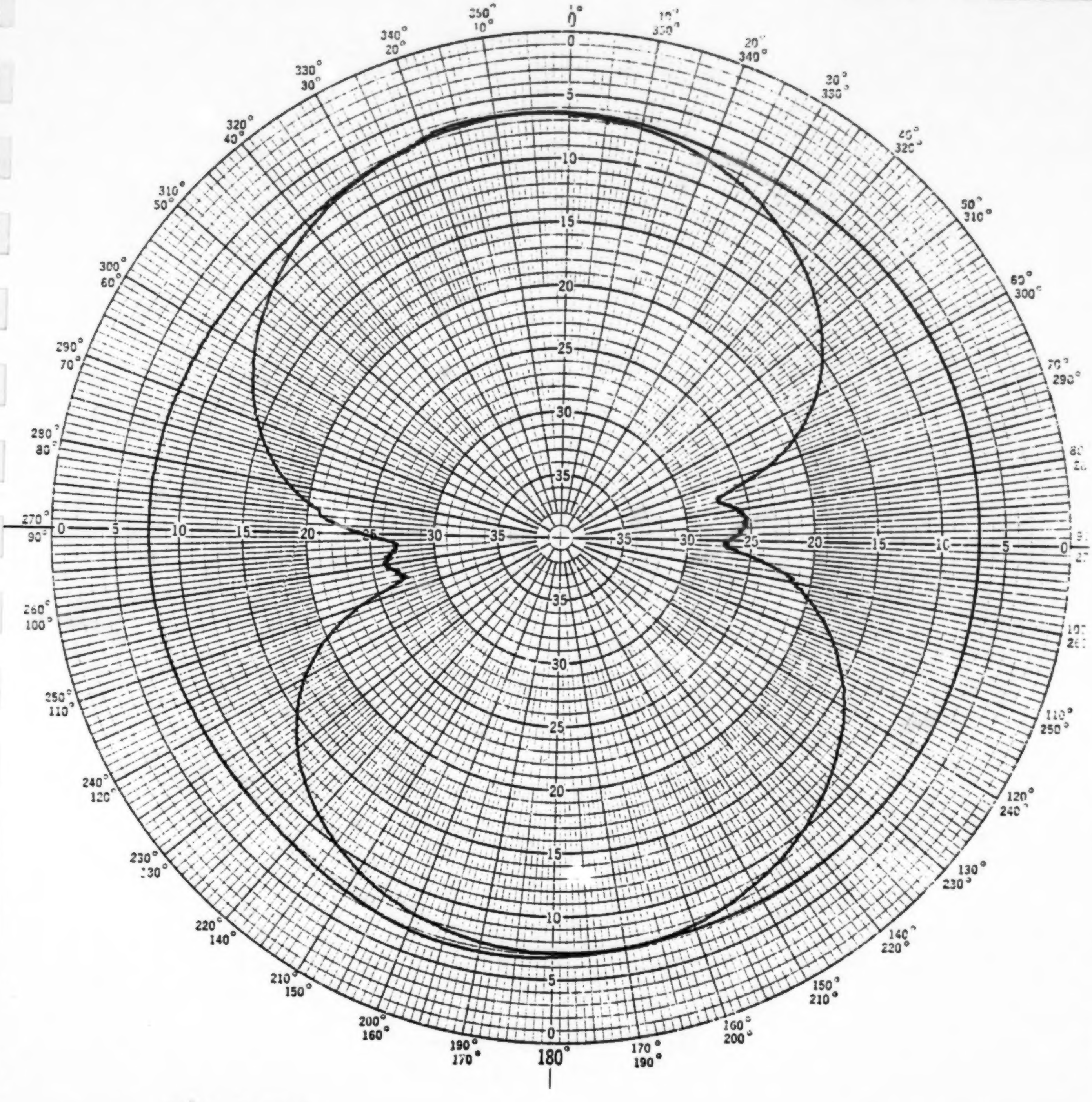
RING RADIUS: 4"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: EFS21



PATTERN: E/H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 19.0. FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

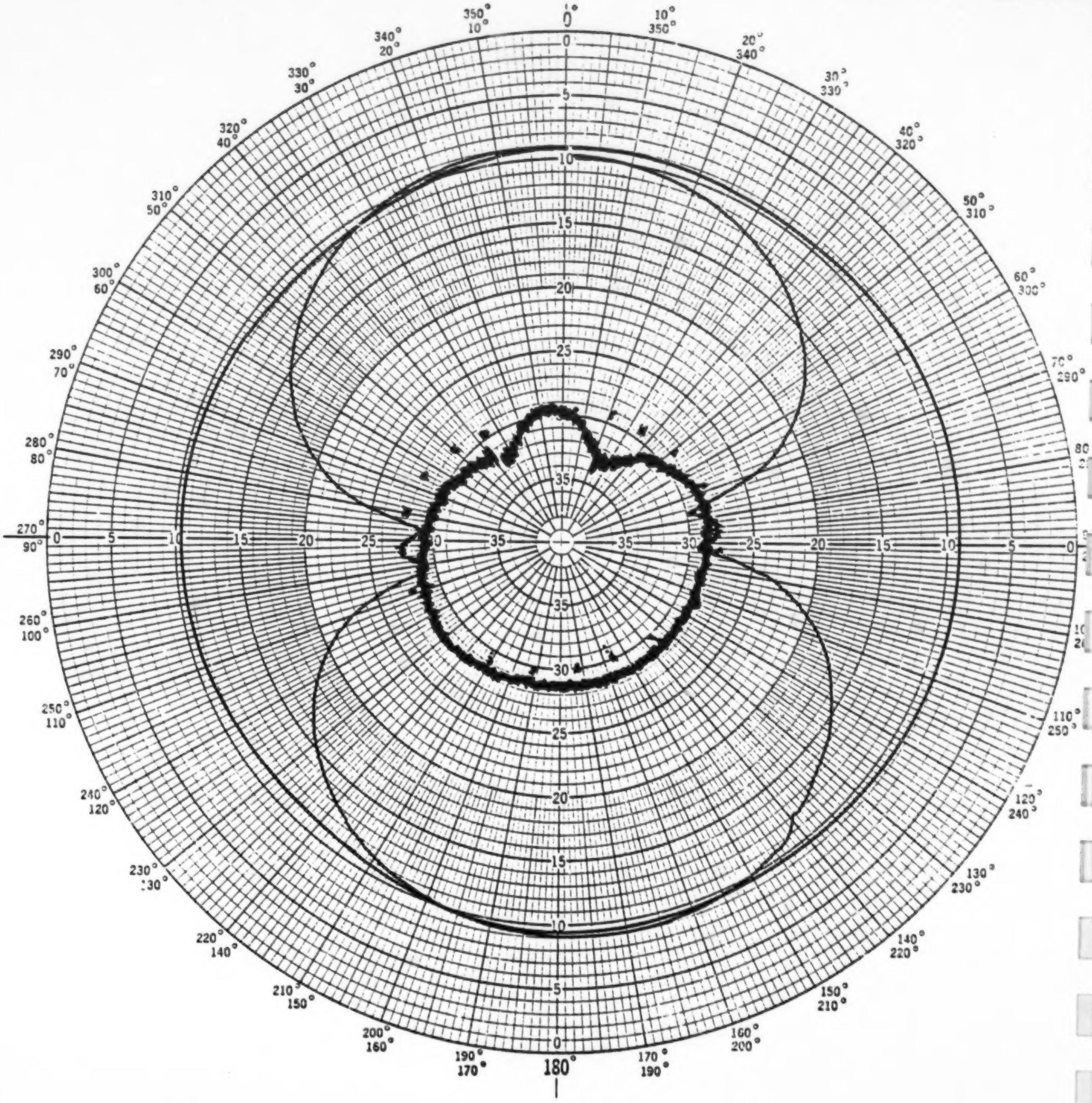
RING RADIUS: 4"

Micro
Communications
Inc.

DATE: 8/12/81

MODEL: F

PATTERN NO.: EFS22



PATTERN: E/H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 190 FT.

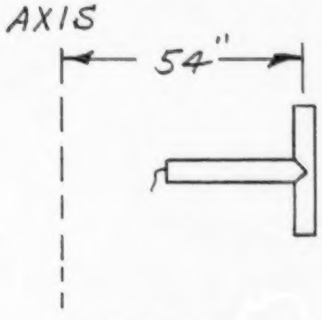
DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 4"

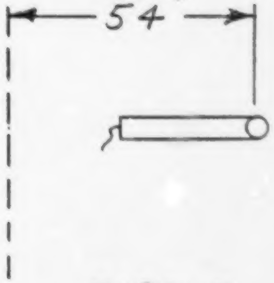
## MODEL "F"
## FREE SPACE MEASUREMENTS
## RANGE CALIBRATION
Radius 54"
August 12, 1981

| PATTERN NUMBER | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | DIPOLE ORIENT-TATION | REMARKS |
|---|---|---|---|---|
| * | | | | |
| FFS23(294) | 19.5 | E/H-Plane | Vert. | |
| FFS24(295) | 28.0 | E/H-Plane | Vert. | |
| FFS25(296) | 16.0 | E/H-Plane | Vert. | |
| FFS26(297) | 9.0 | E/H-Plane | Vert. | |
| FFS27(298) | 18.0 | E-Plane | +90 | |
| FFS28(299) | 18.0 | E-Plane | +45 | |
| FFS29(300) | 18.0 | E-Plane | Hoz. | |
| FFS30(301) | 18.0 | H-Plane | Hoz. | |
| FFS31(302) | 28.0 | E/H-Plane | Hoz. | |
| FFS32(303) | 16.0 | E/H-Plane | Hoz. | |
| FFS33(304) | 16.0 | H-Plane | +90 | |
| FFS34(305) | 16.0 | E/H-Plane | +45 | |

*Page Numbers



DIPOLE
VERTICAL



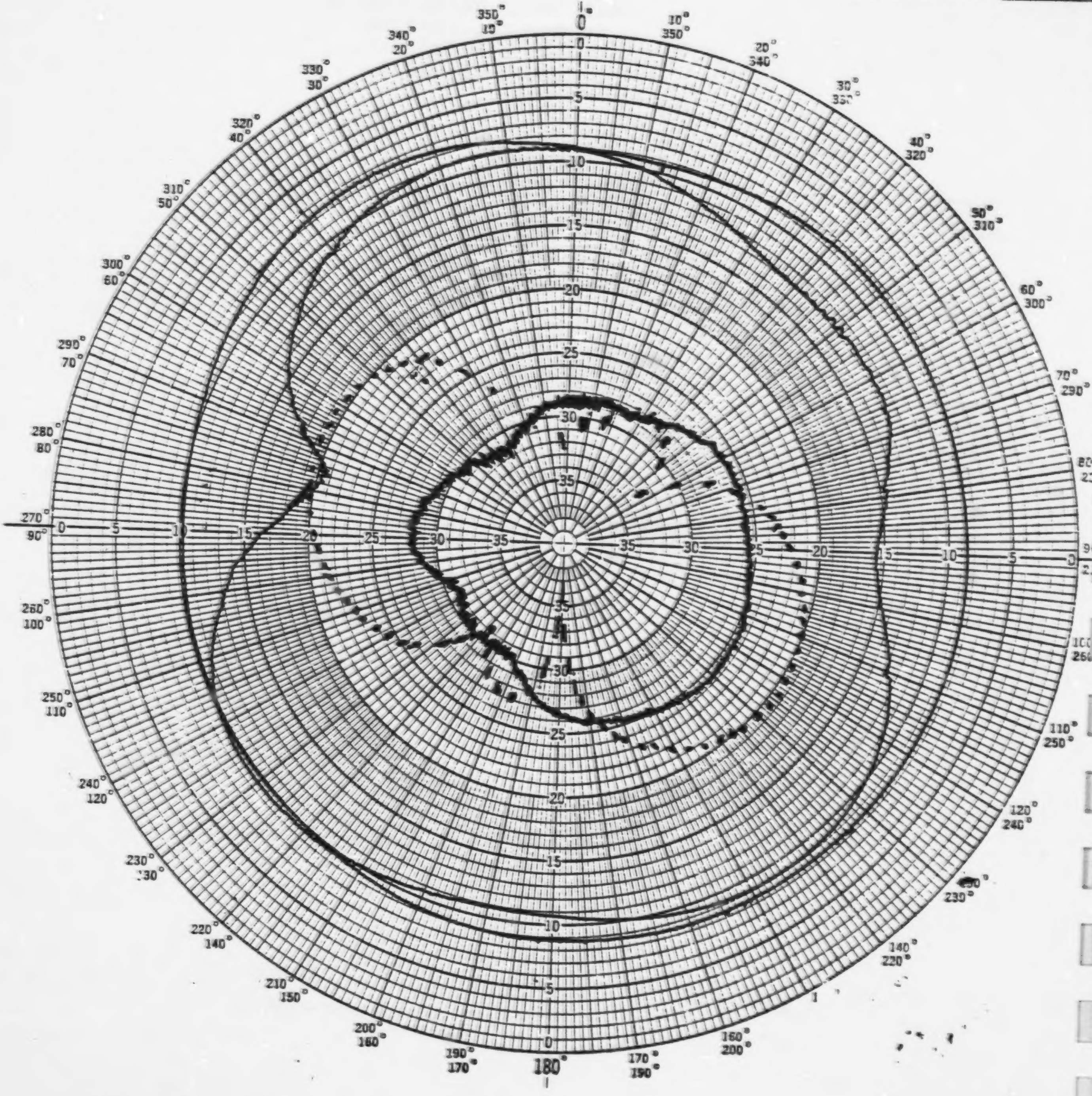
DIPOLE
HORIZONTAL

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: EFS23



PATTERN: E/H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 19.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

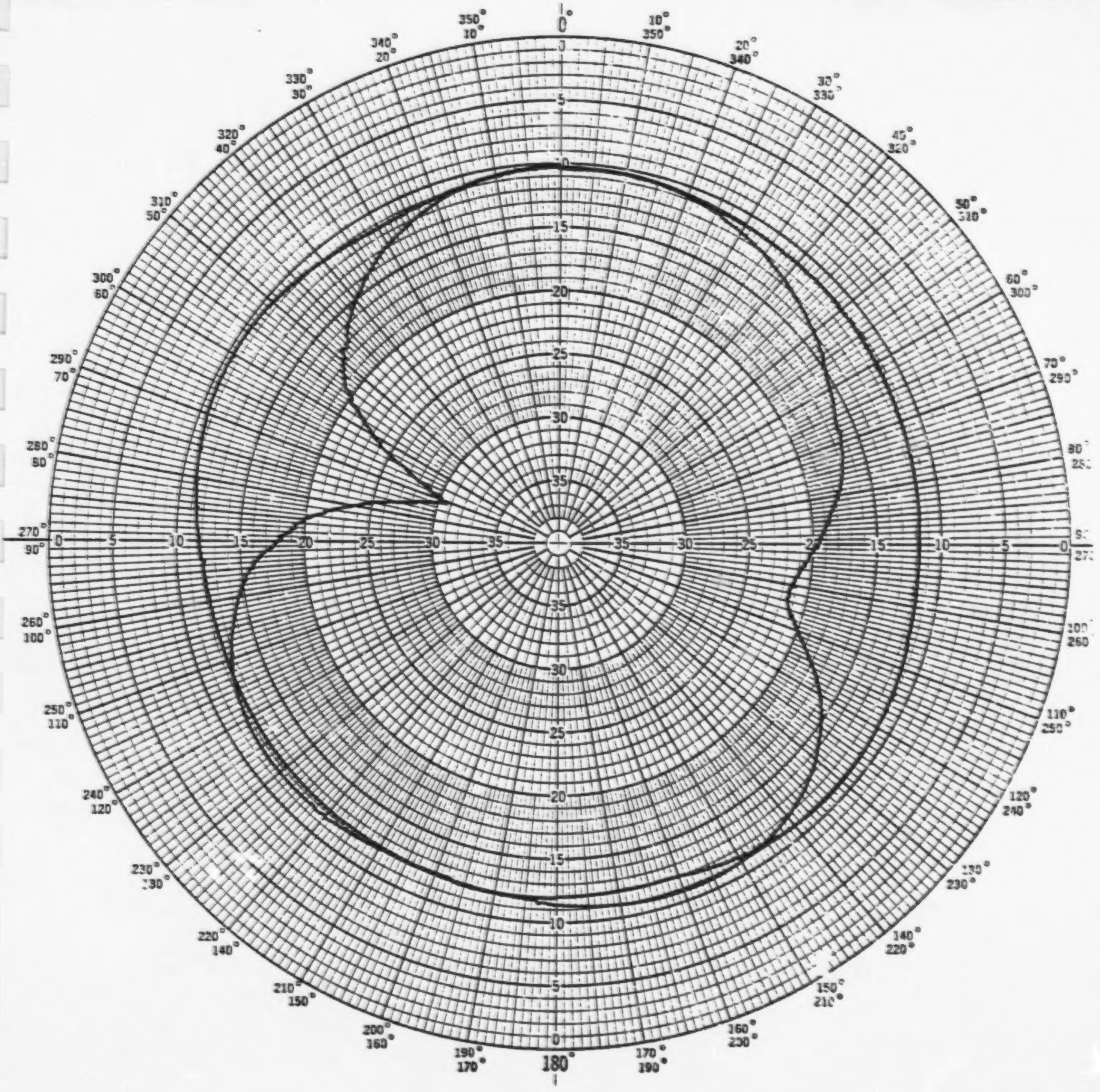
RING RADIUS: 54"

**Micro Communications Inc.**

DATE: 6/12/81

MODEL: F

PATTERN NO.: FFS24



PATTERN: E/H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 28.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT

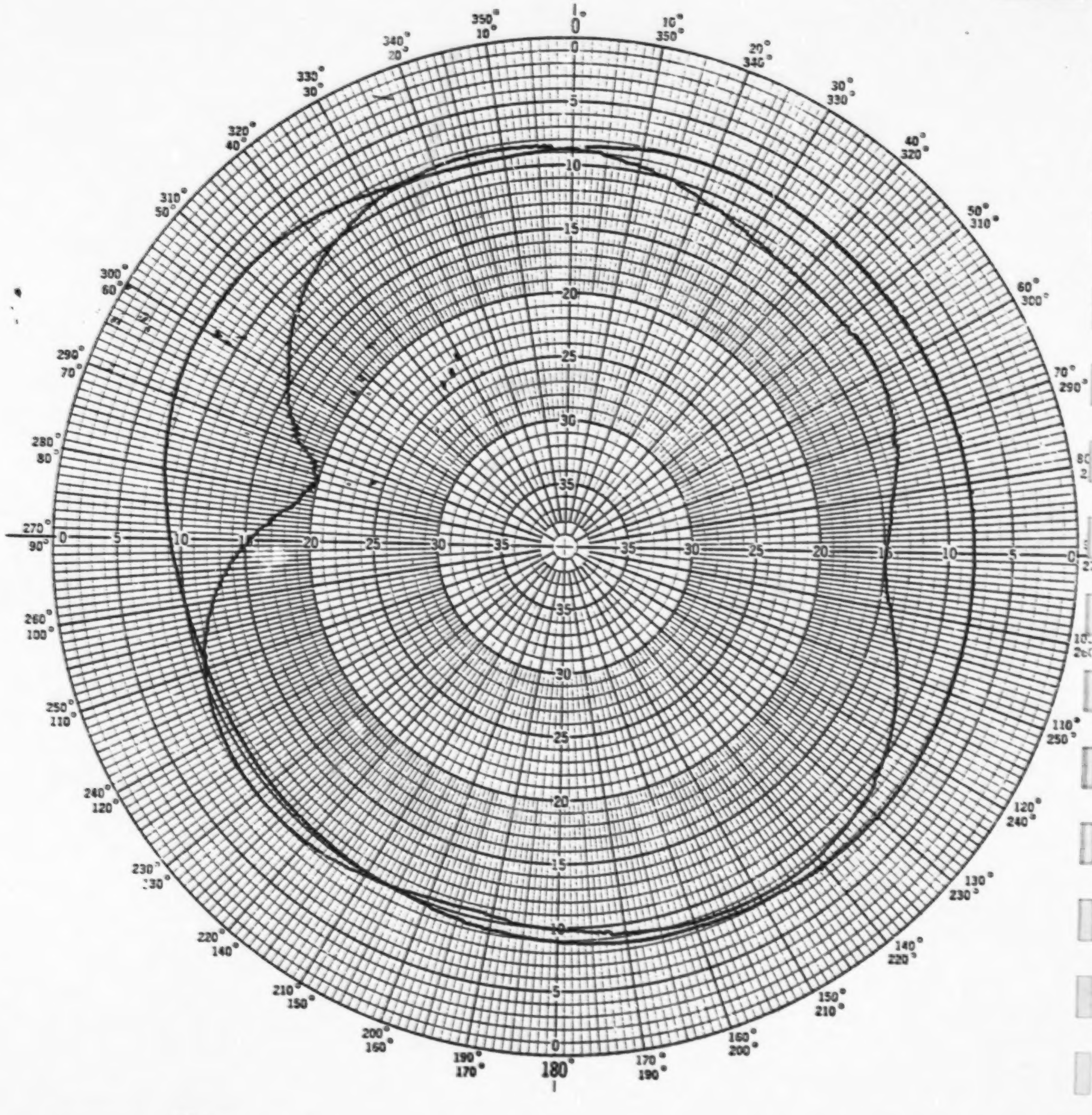
RING RADIUS: 54"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS25



PATTERN: E/H - PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTIN
ANTENNA: 16.0 FT.

DIST. FROM TRANS. ANT
TO TEST ANT.: 131 FT

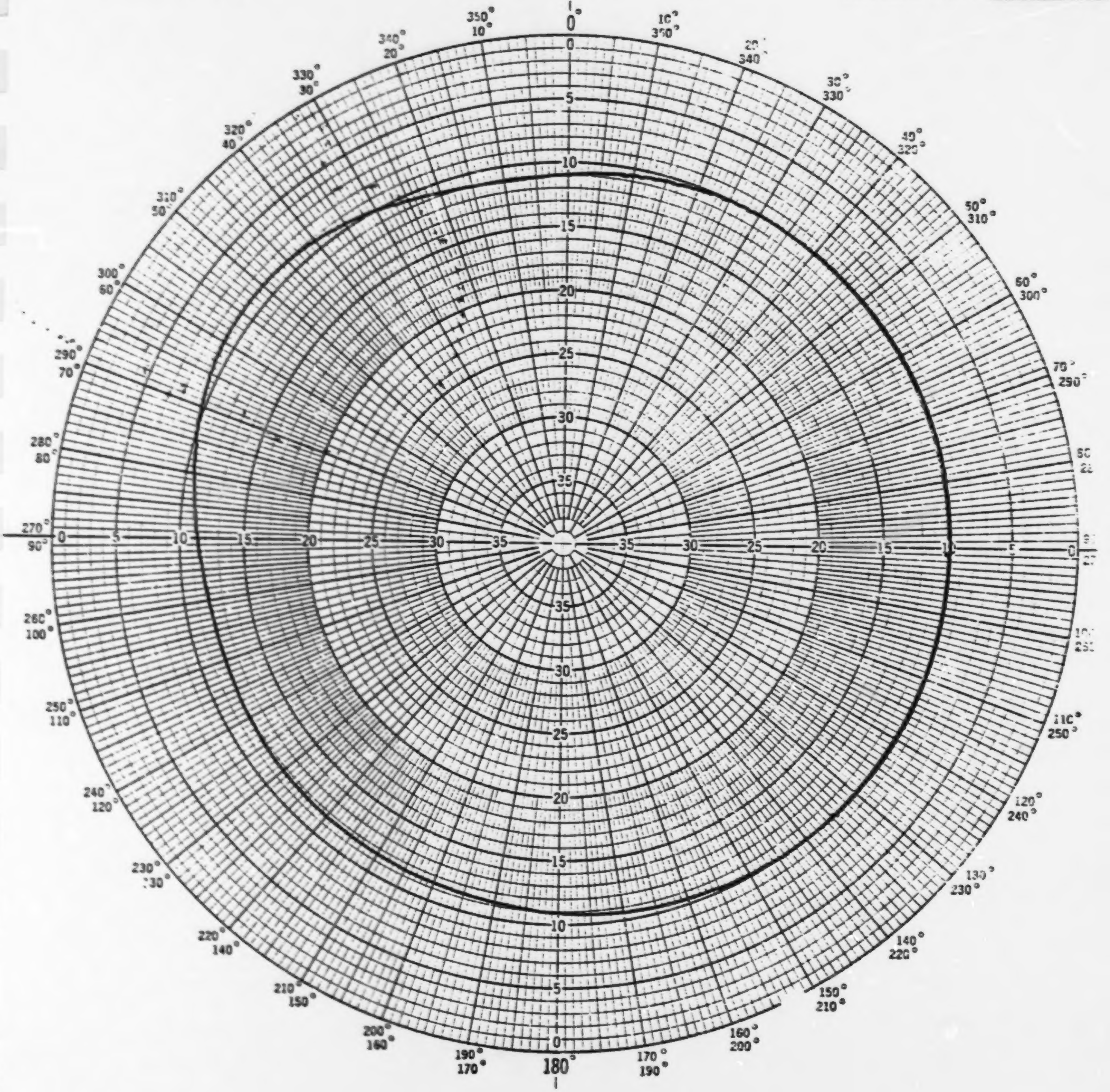
RING RADIUS: 54"

MCi **Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS26



PATTERN: H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 9 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

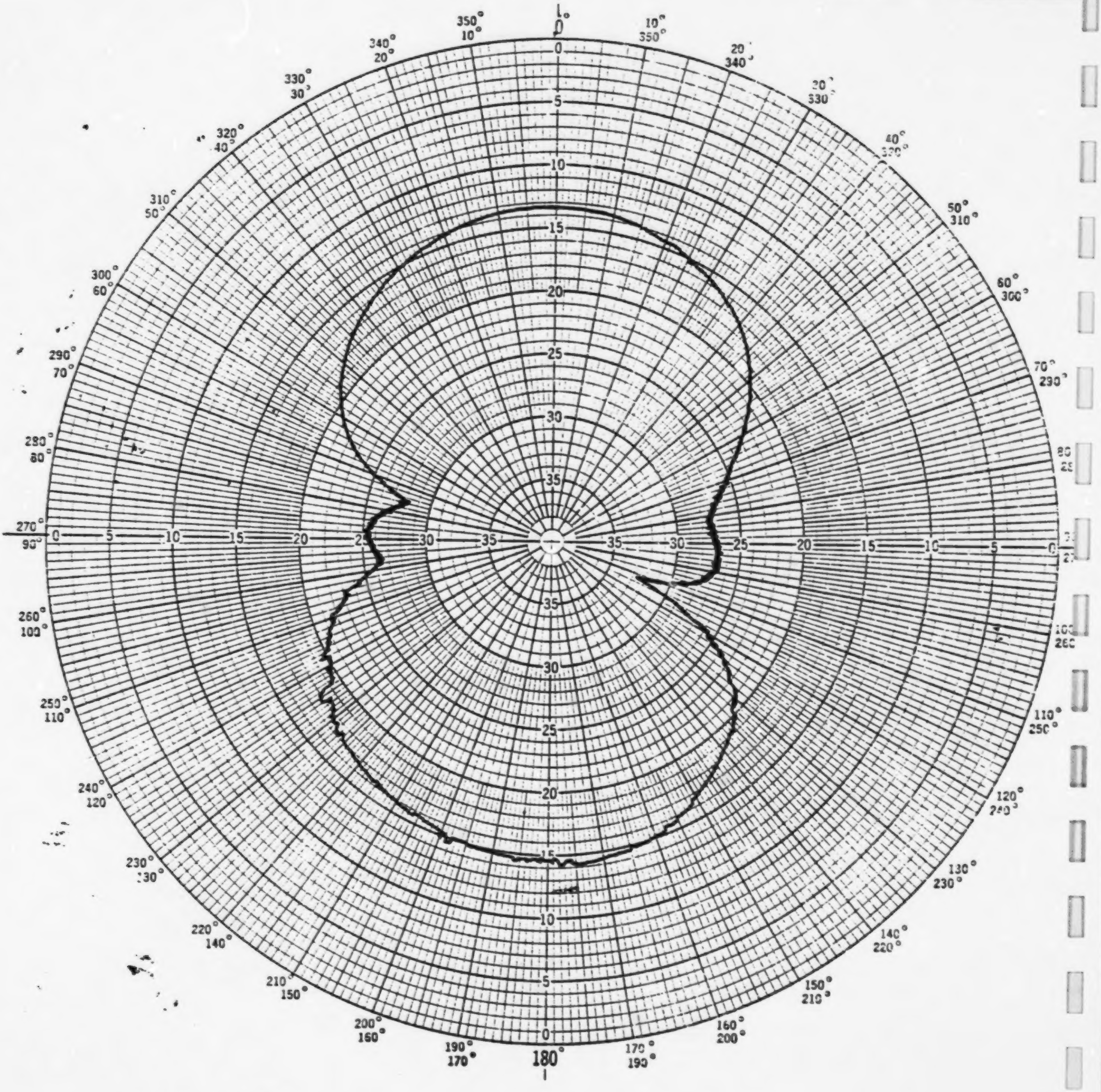
RING RADIUS: 54"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS27



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION:

HEIGHT OF TRANSMITTING
ANTENNA: 18 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

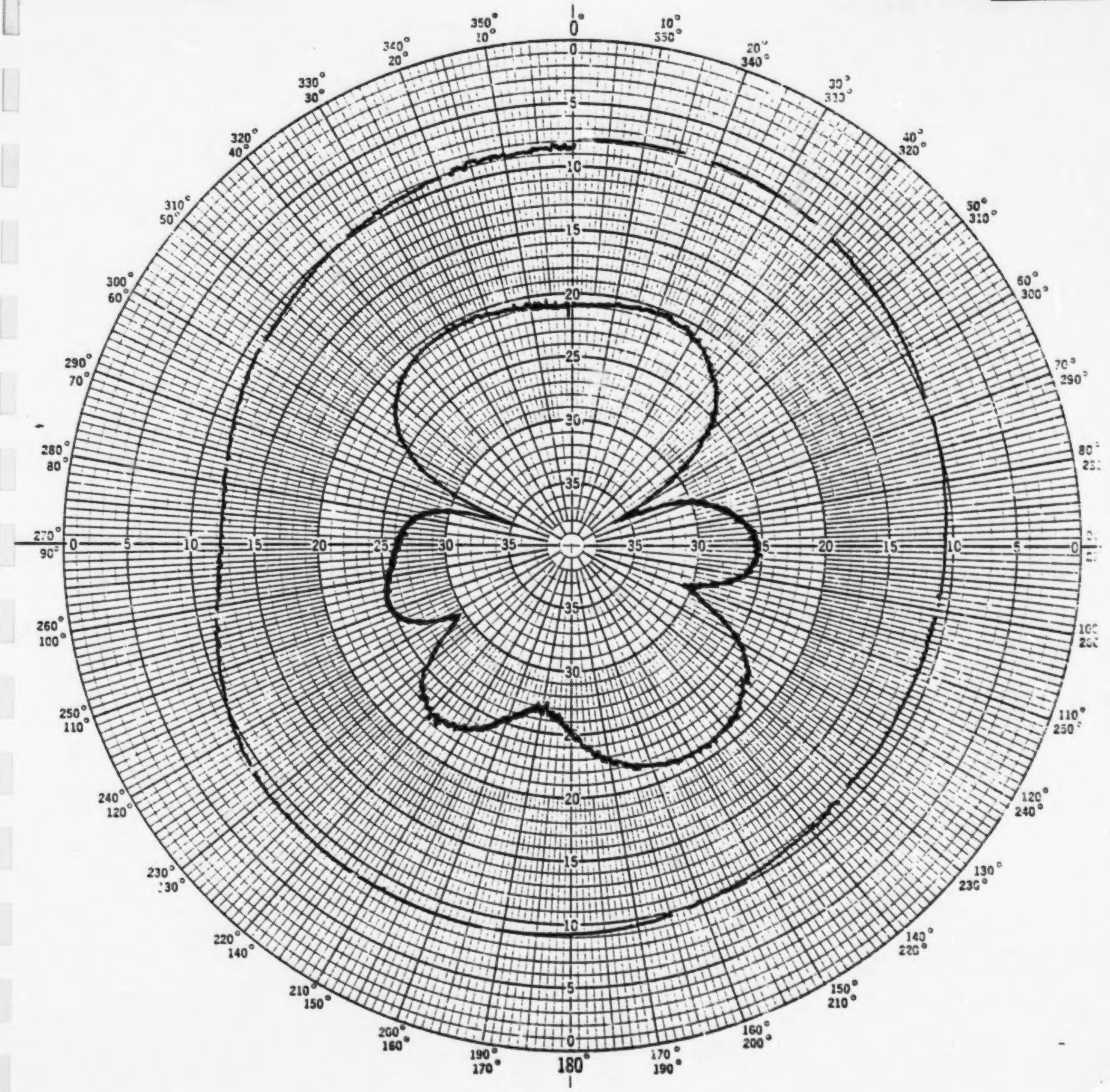
RING RADIUS: 54"

**Micro Communications Inc.**

DATE: 6/12/81

MODEL: F

PATTERN NO.: FFS28



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: ______

HEIGHT OF TRANSMITTING
ANTENNA: 18.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

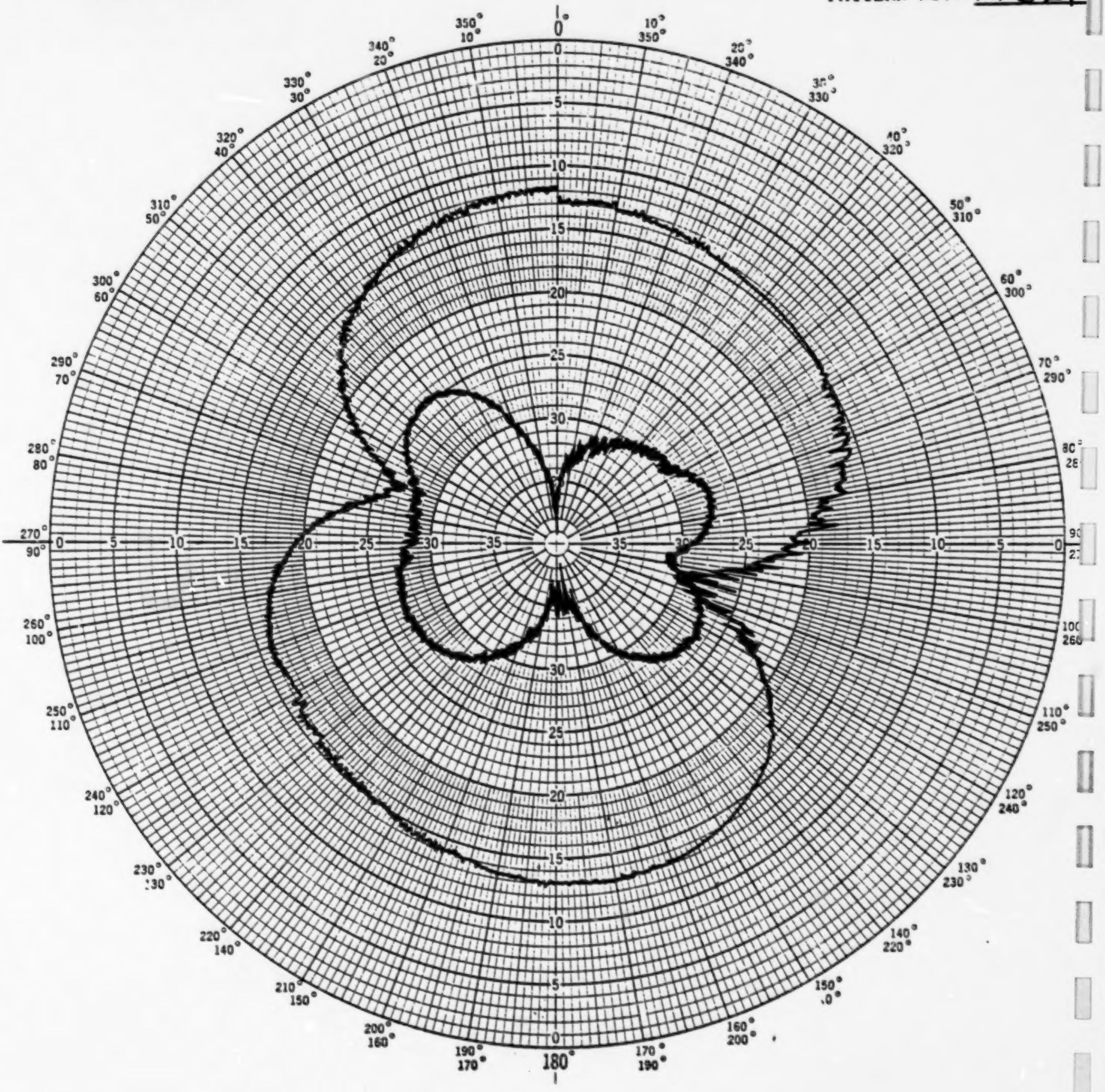
RING RADIUS: 54"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS29



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 18.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

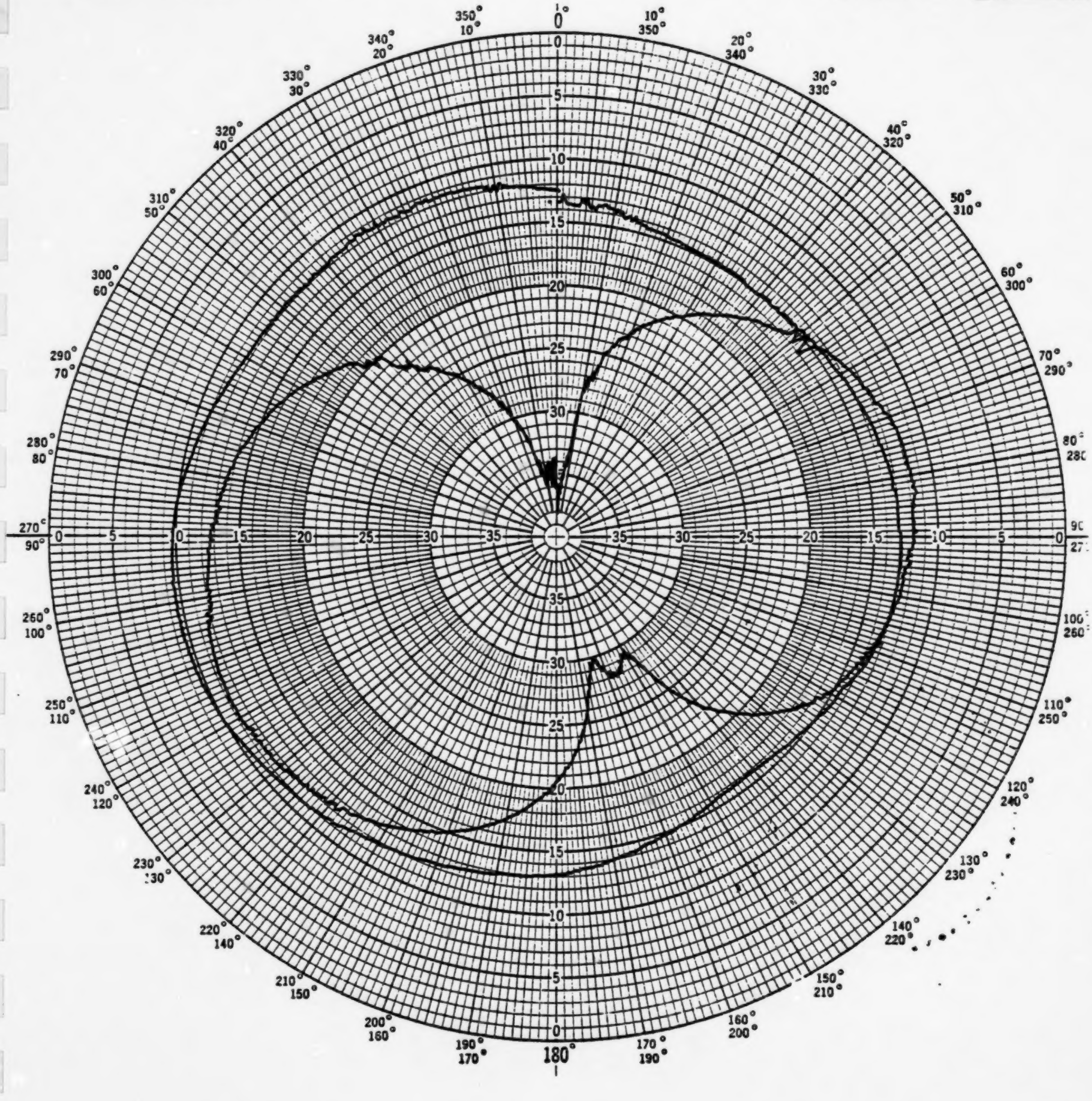
RING RADIUS: 54"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS30



PATTERN: H-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 18.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

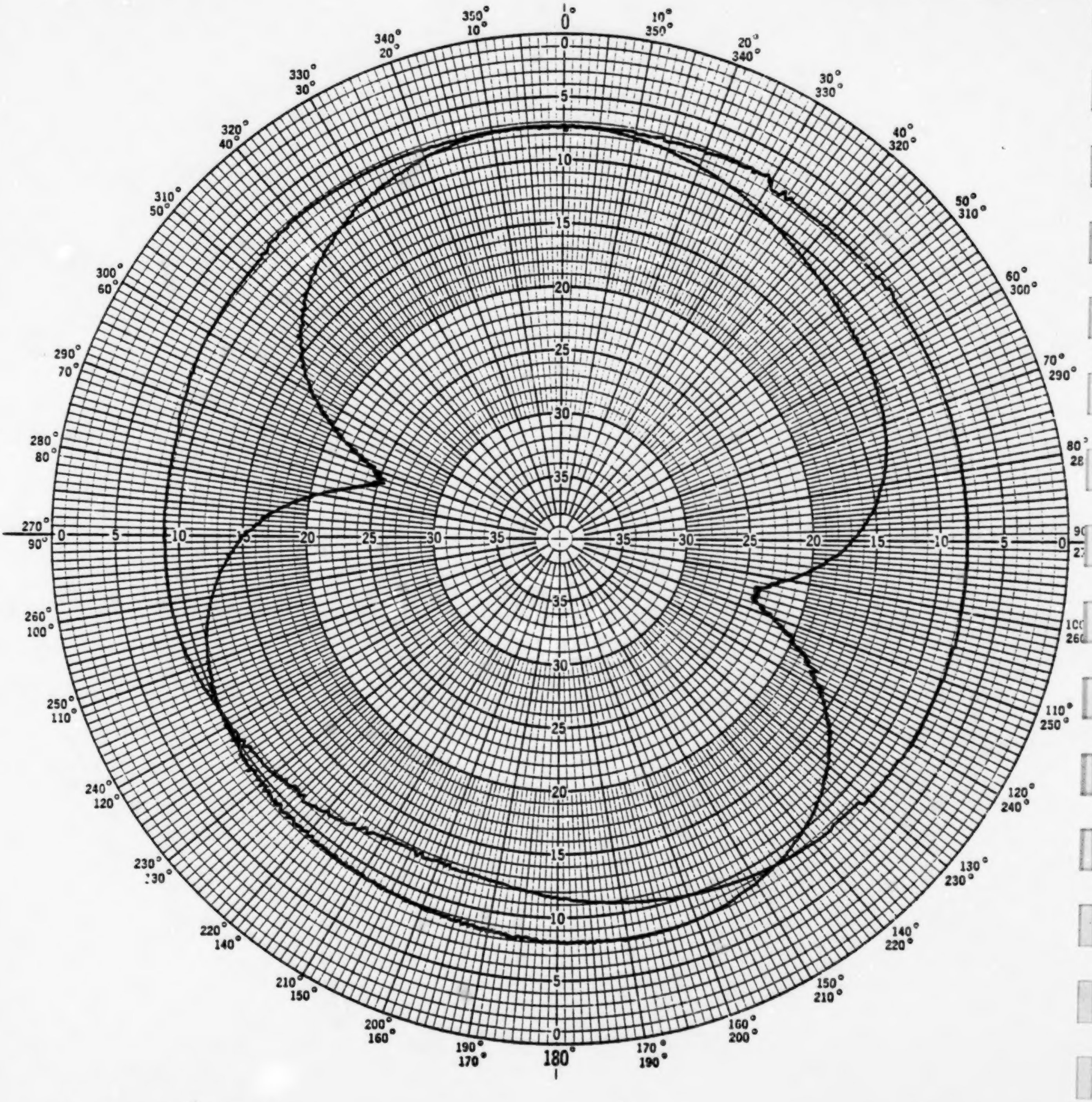
RING RADIUS: 54"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS31



PATTERN: E/H PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 28.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

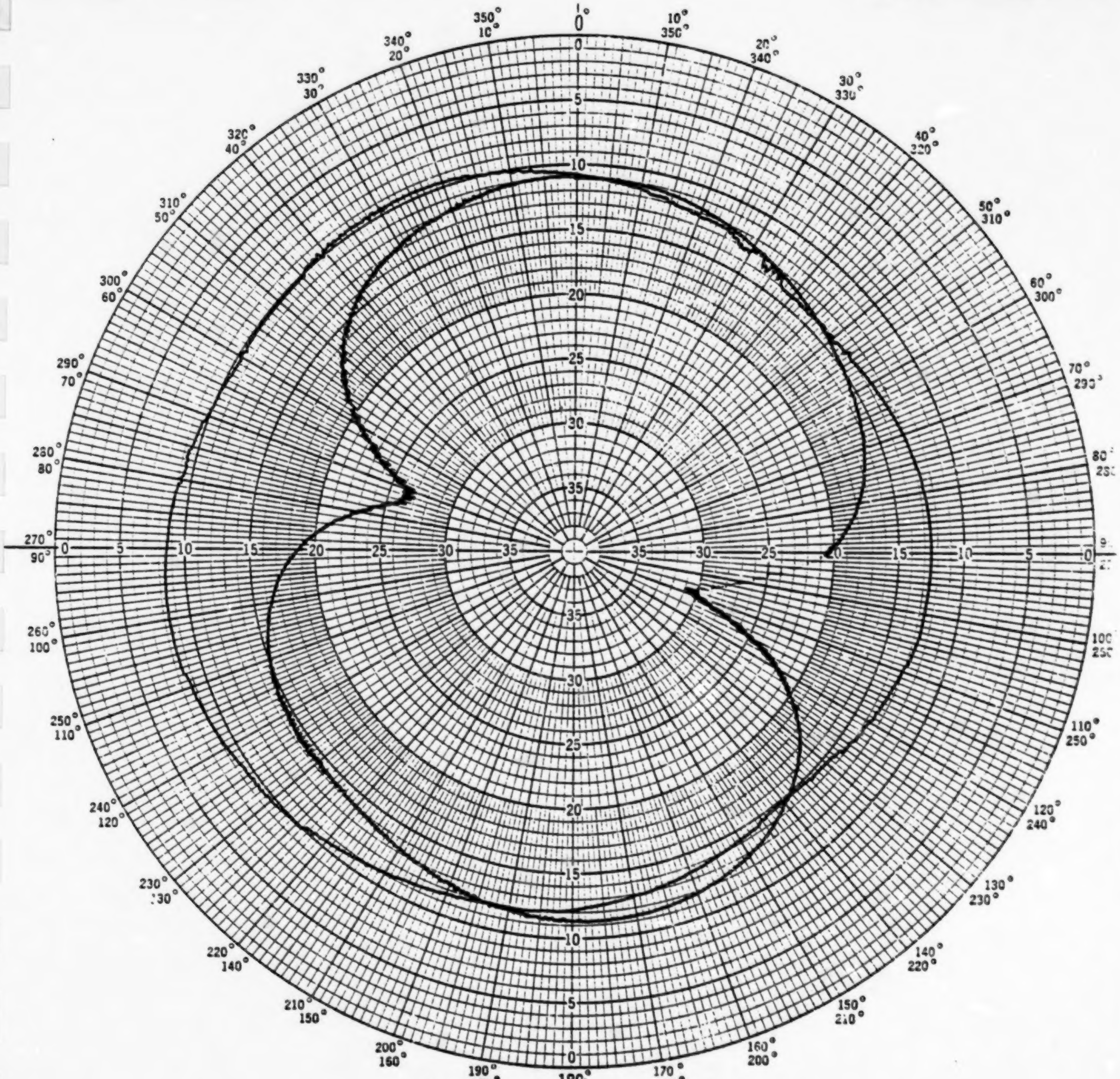
RING RADIUS: 54"

**Micro Communications Inc.**

DATE: [illegible]

MODEL: F

PATTERN NO.: FFS32



PATTERN: E/H PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: VERT

HEIGHT OF TRANSMITTING
ANTENNA: 16.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT

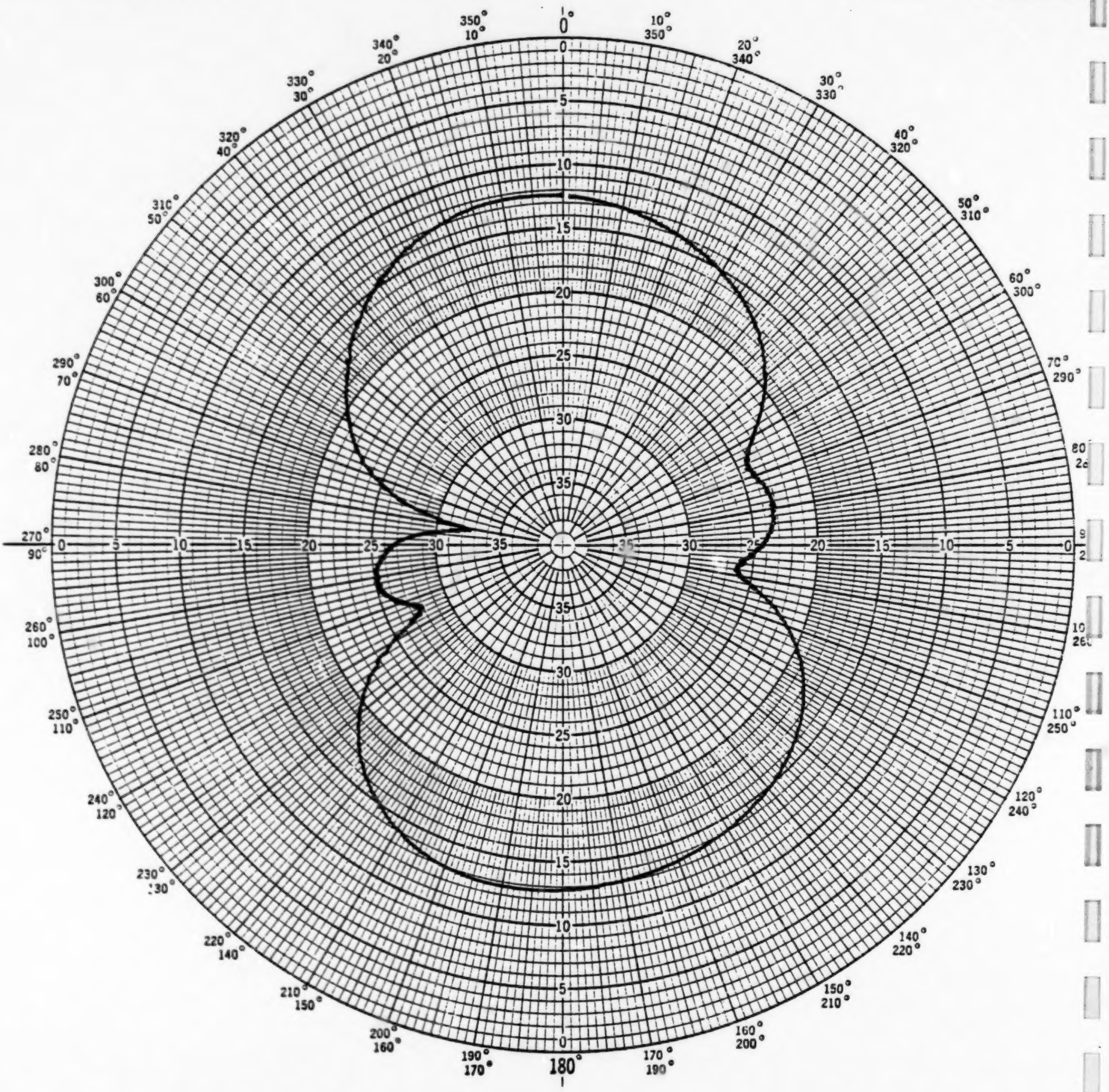
RING RADIUS: 54"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FFS33



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION:

HEIGHT OF TRANSMITTING
ANTENNA: 16.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

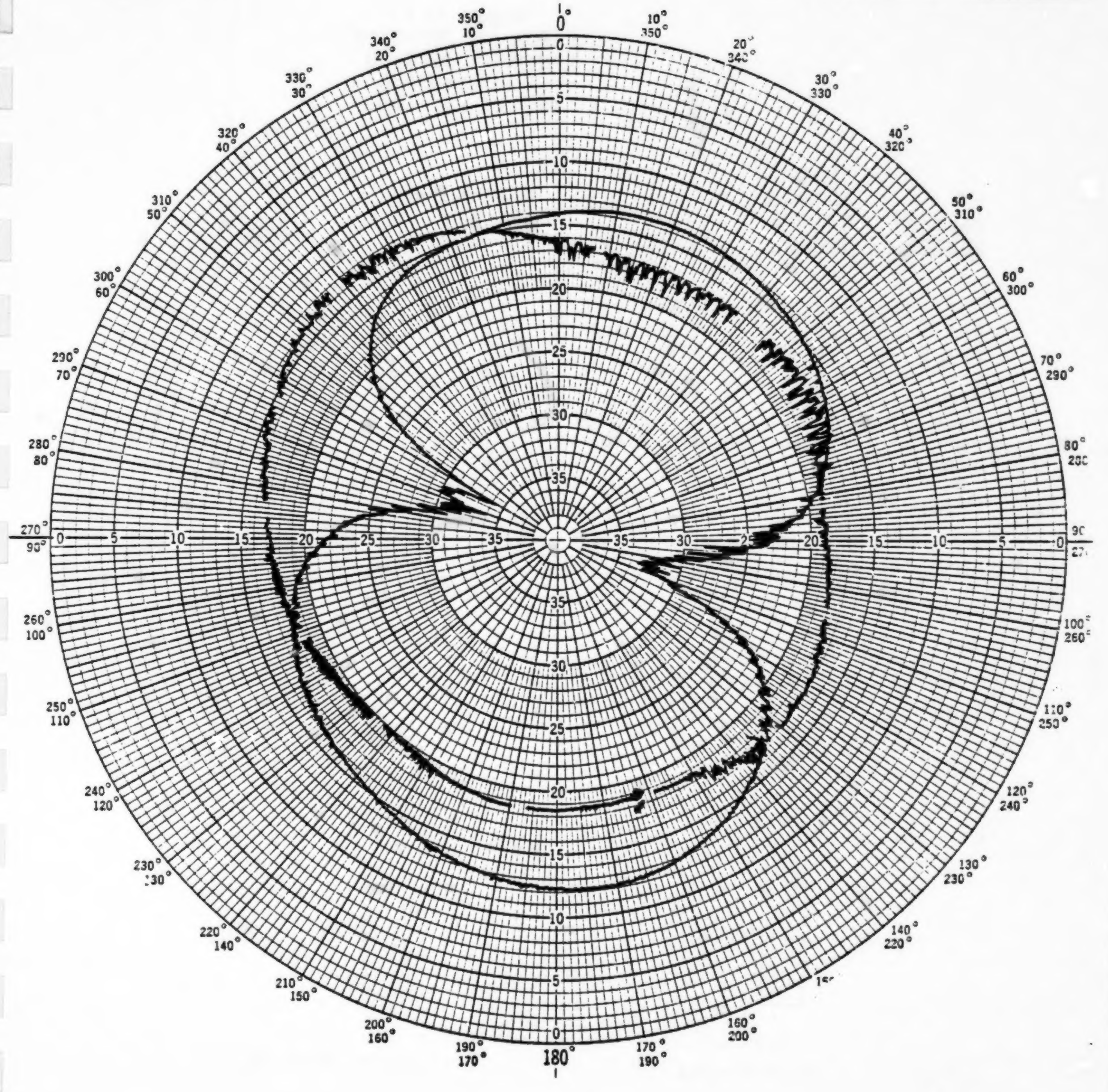
RING RADIUS: 54"

**Micro Communications Inc.**

DATE: 6/12/81

MODEL: F

PATTERN NO.: FFS34



PATTERN: ______

ANTENNA LOCATION
ON TOWER: FREE SPACE

TRANSMITTING ANTENNA
POLARIZATION: ______

HEIGHT OF TRANSMITTING
ANTENNA: 16.0 FT.

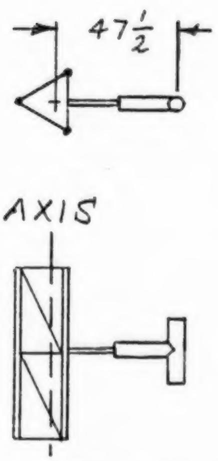
DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: ______

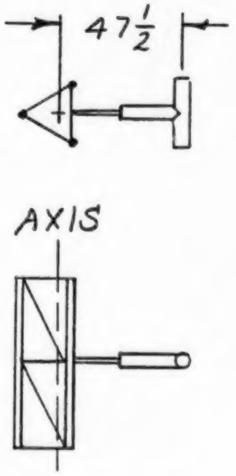
# MODEL "F"
# RANGE CALIBRATION
# ANTENNA MOUNTED
# ON TOWER FACE
August 12, 1981

| PATTERN NUMBER<br>* | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | DIPOLE ORIENTATION | REMARKS |
|---|---|---|---|---|
| FF1 (307) | 16.0 | E/H-Plane | Vert. | |
| FF2 (308) | 19.0 | E/H-Plane | Vert. | |
| FF3 (309) | 19.0 | ???? | +90 | |
| FF4 (310) | 9.0 | ???? | +45 | |
| FF5 (311) | 19.0 | ???? | Hoz. +45 | |
| FF6 (312) | 19.0 | E/H-Plane | Hoz. | |
| FF7 (313) | 16.0 | E/H-Plane | Hoz. | |
| FF8 (314) | 19.0 | ???? | +90 | |

*Page Numbers



DIPOLE
VERTICAL



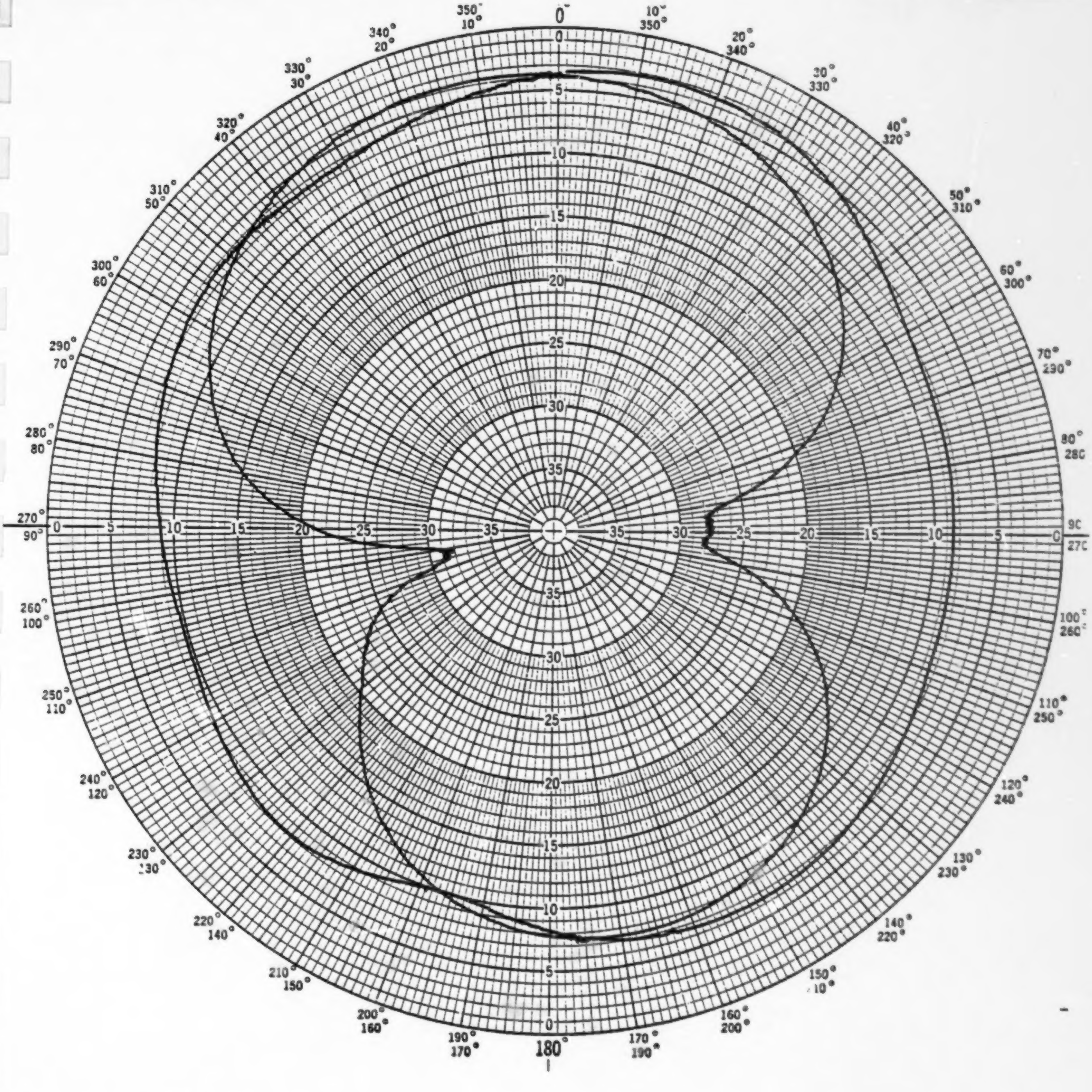
DIPOLE
HORIZONTAL

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: EE1



PATTERN: E/H - PLANE

ANTENNA LOCATION
ON TOWER FACE

TRANSMITTING ANTENNA
POLARIZATION: Hoz.

HEIGHT OF TRANSMITTING
ANTENNA: 16.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT

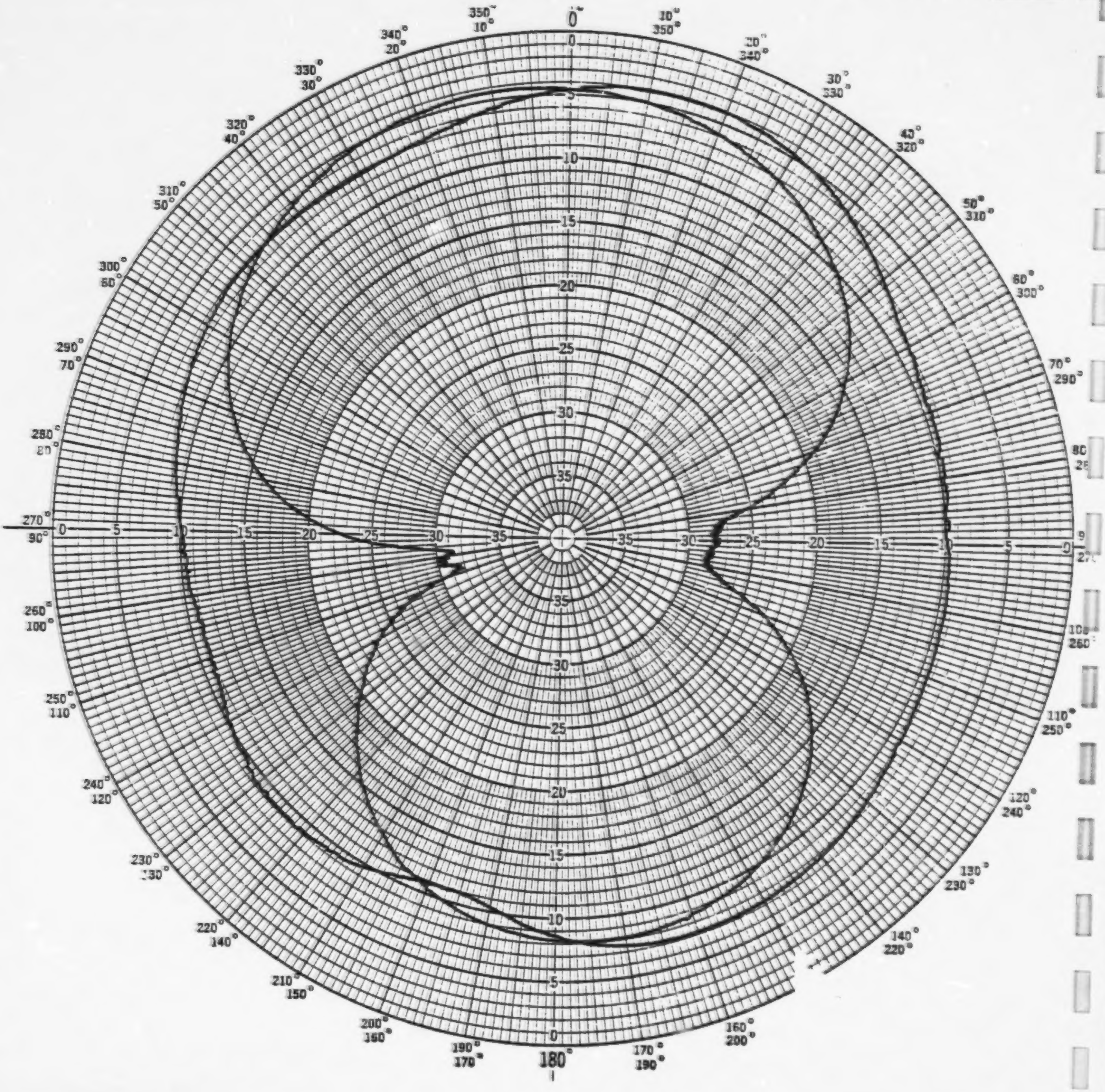
RING RADIUS: 47.5"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FF2



PATTERN: E/H-PLANE

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTIN
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT
TO TEST ANT.: 131 FT

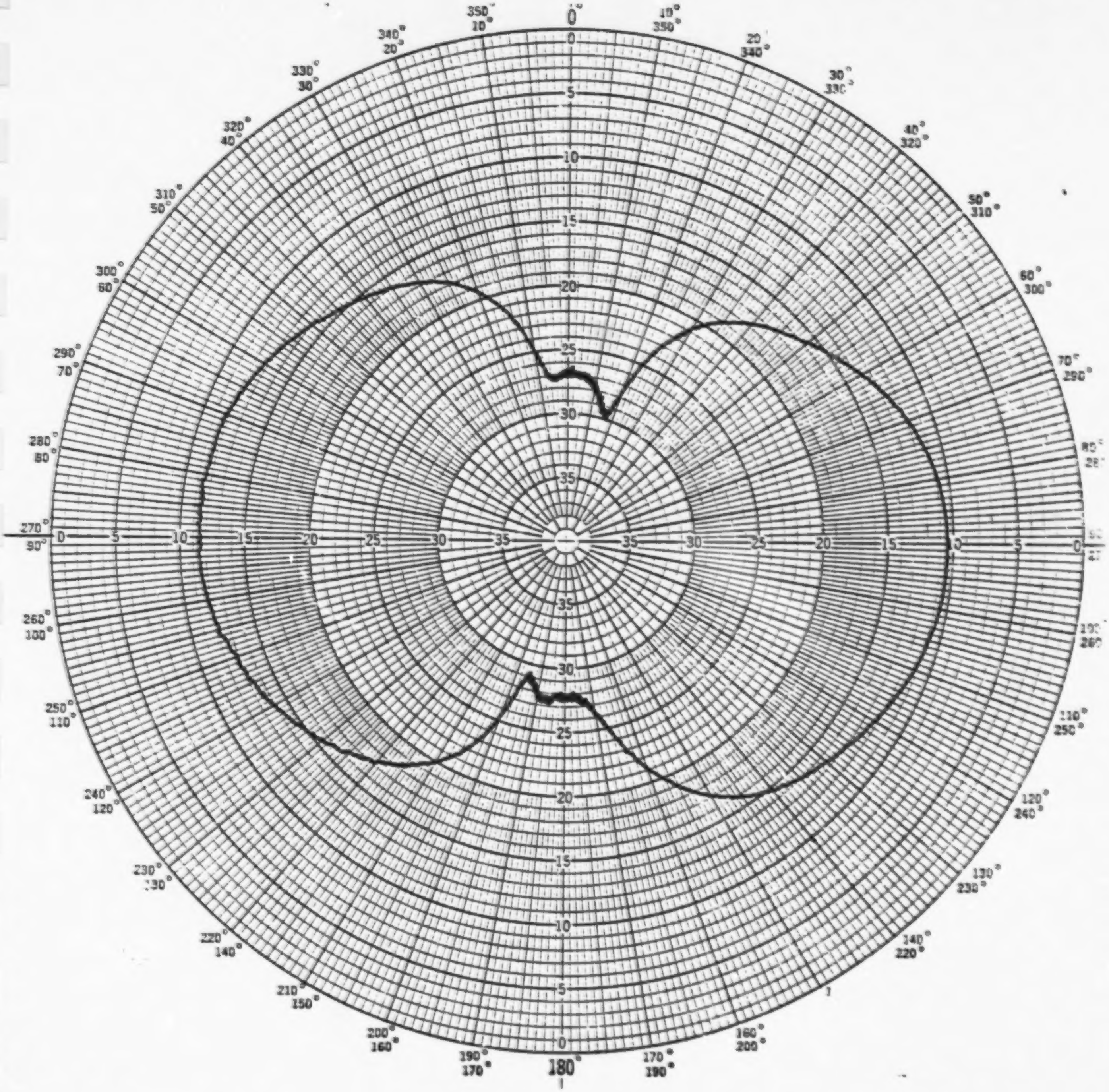
RING RADIUS: 47.5"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FF3



PATTERN: ________

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

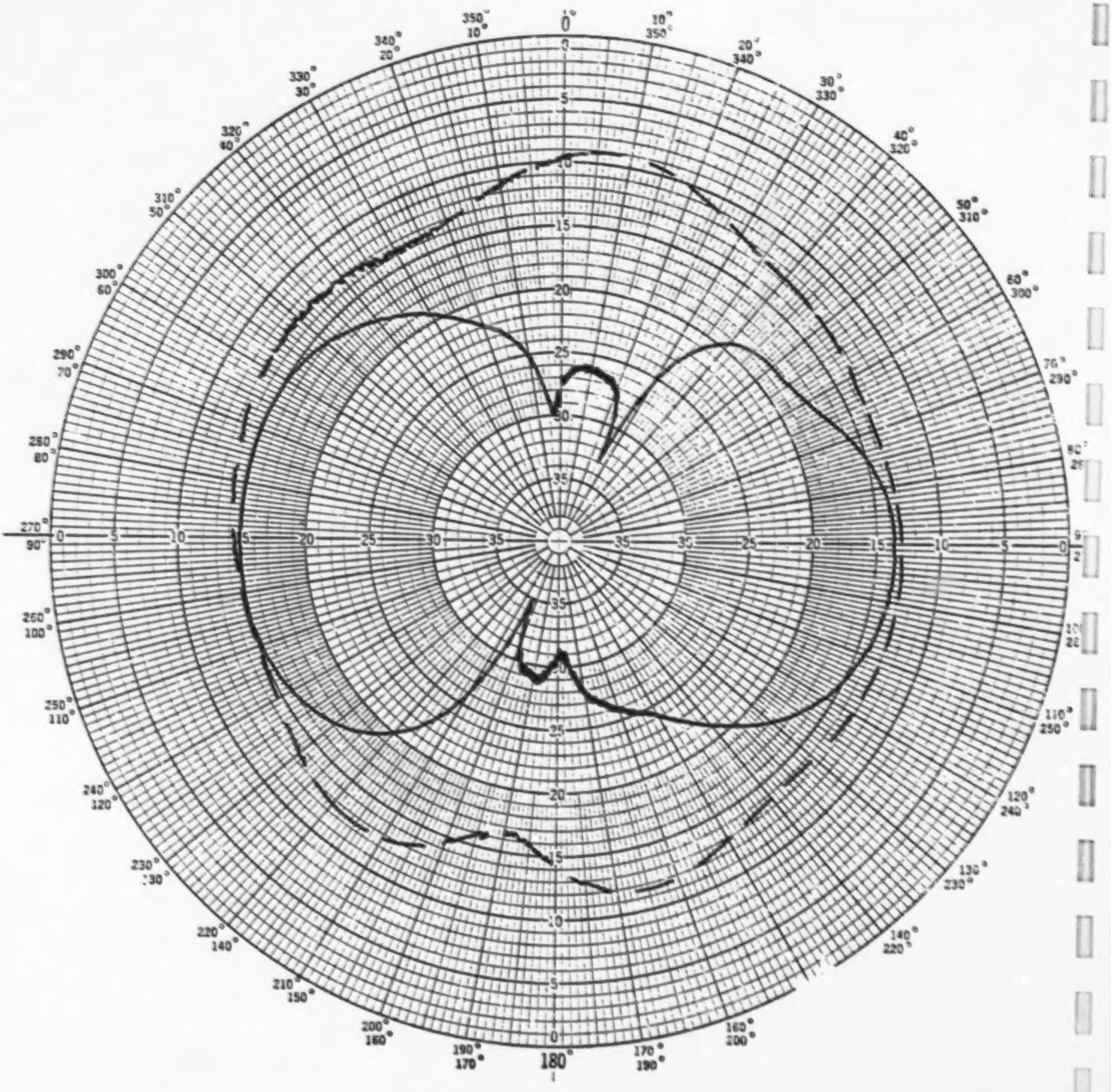
RING RADIUS: 47.5"

Micro
Communications
Inc.

DATE: [illegible]

MODEL: F

PATTERN NO.: FF4



PATTERN: ______

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

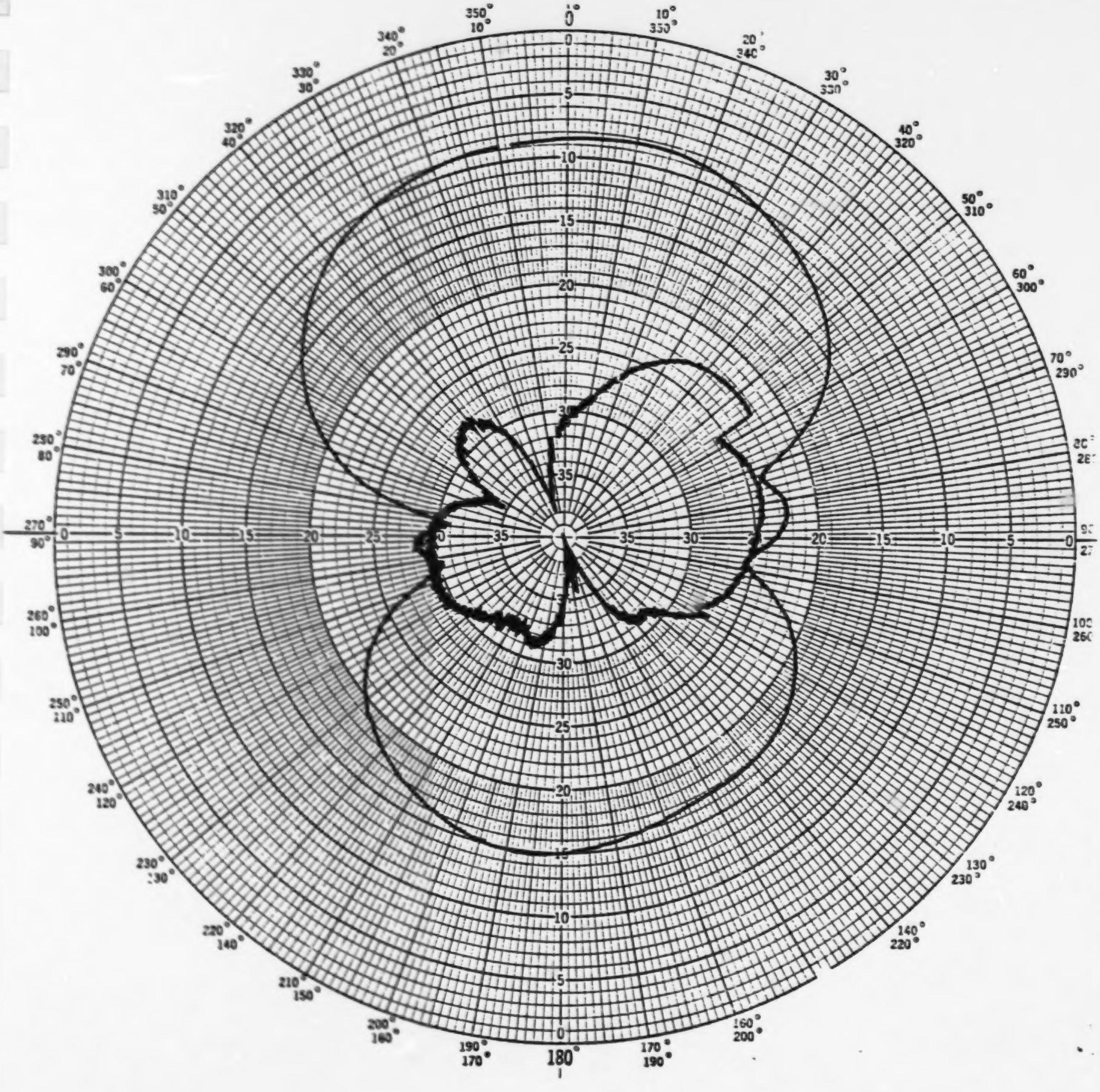
RING RADIUS: 47.5"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FF5



PATTERN: ____________

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: VERT.

HEIGHT OF TRANSMITTING ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

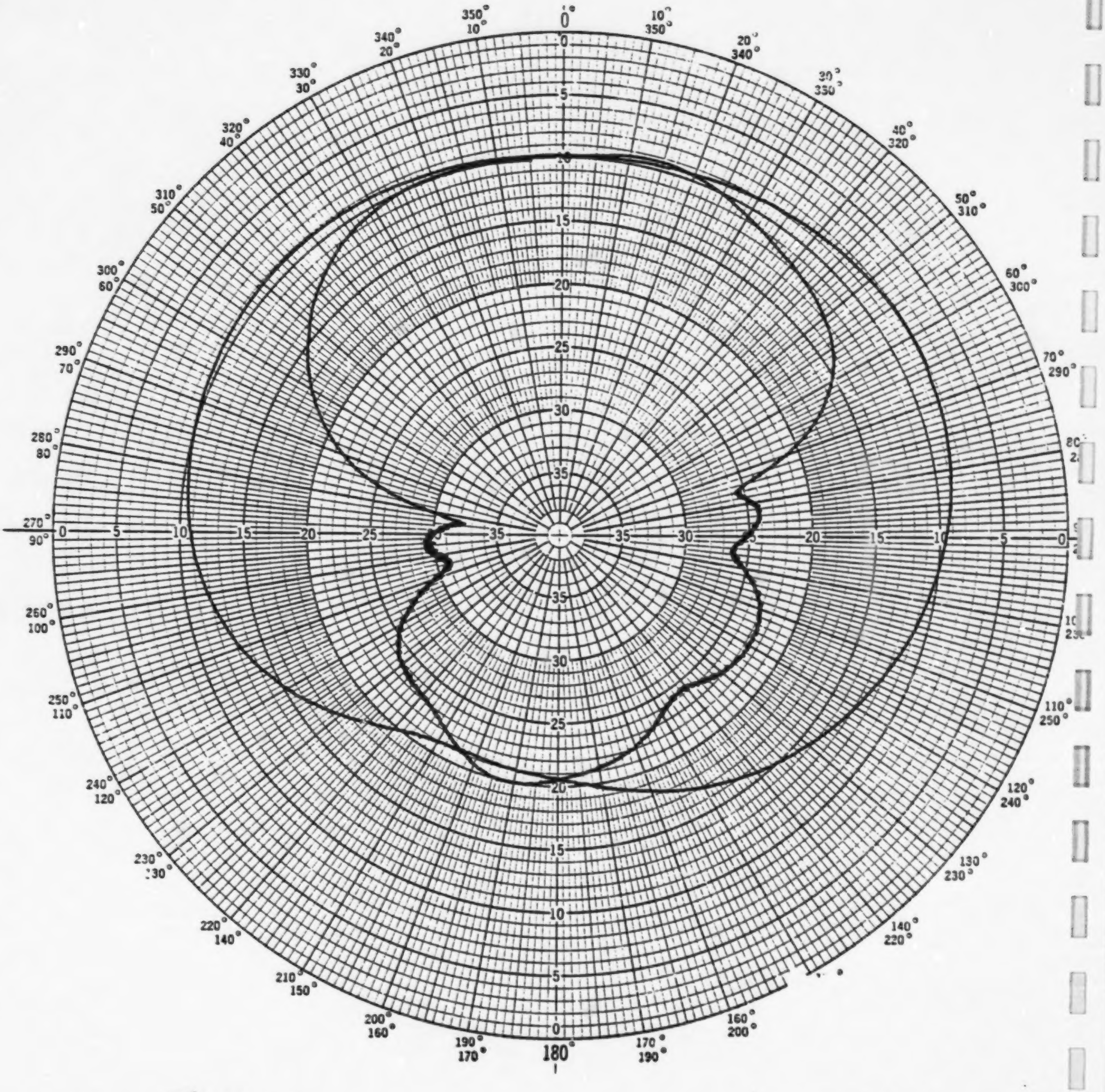
RING RADIUS: 47.5"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FF6



PATTERN: E/H PLANE

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

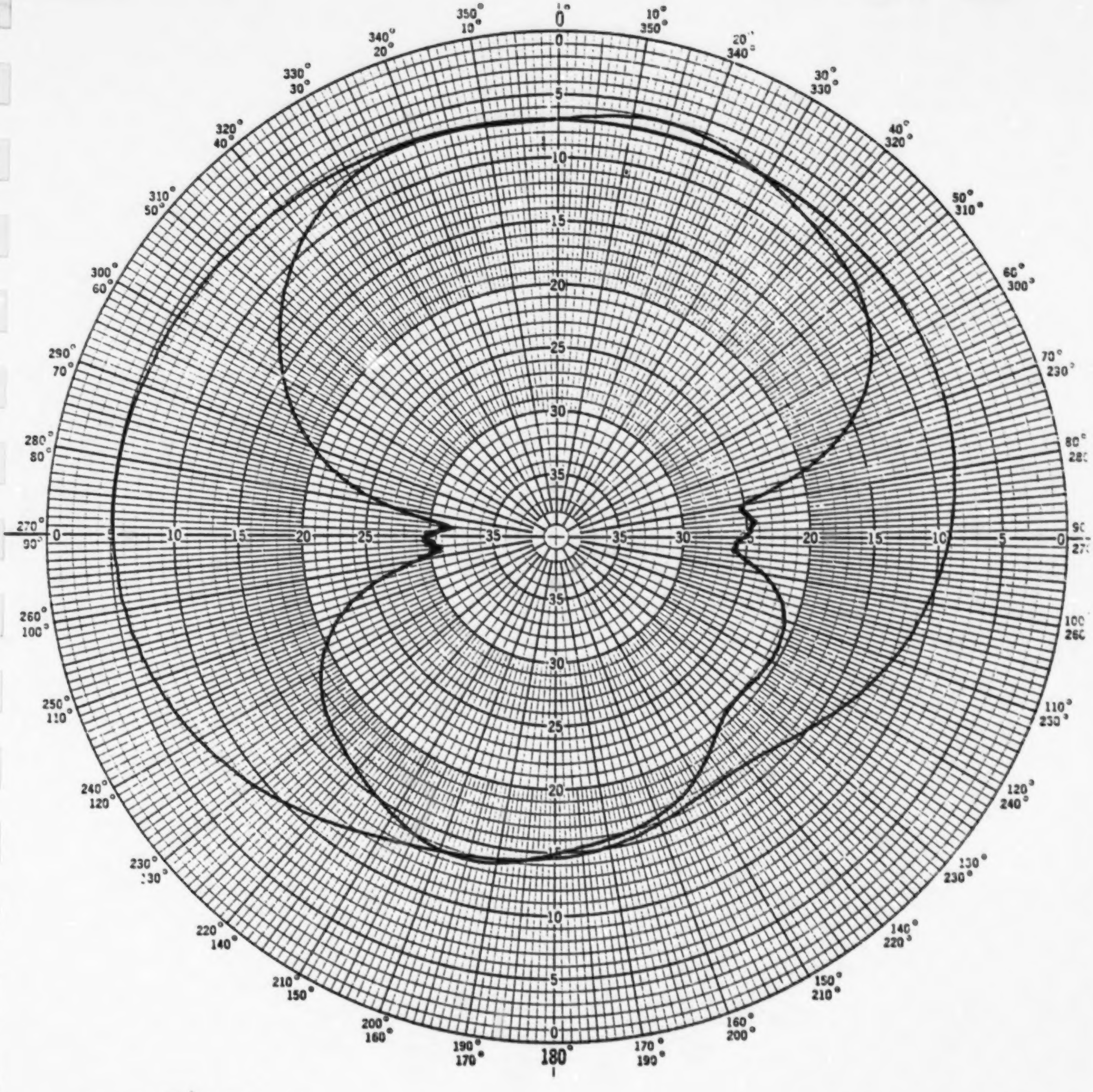
DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 47.5"

Micro
Communications
Inc.

MODEL: F

PATTERN NO.: FF7



PATTERN: E/H PLANE

ANTENNA LOCATION
ON TOWER: FACE

TRANSMITTING ANTENNA
POLARIZATION: VERT.

HEIGHT OF TRANSMITTING
ANTENNA: 16.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

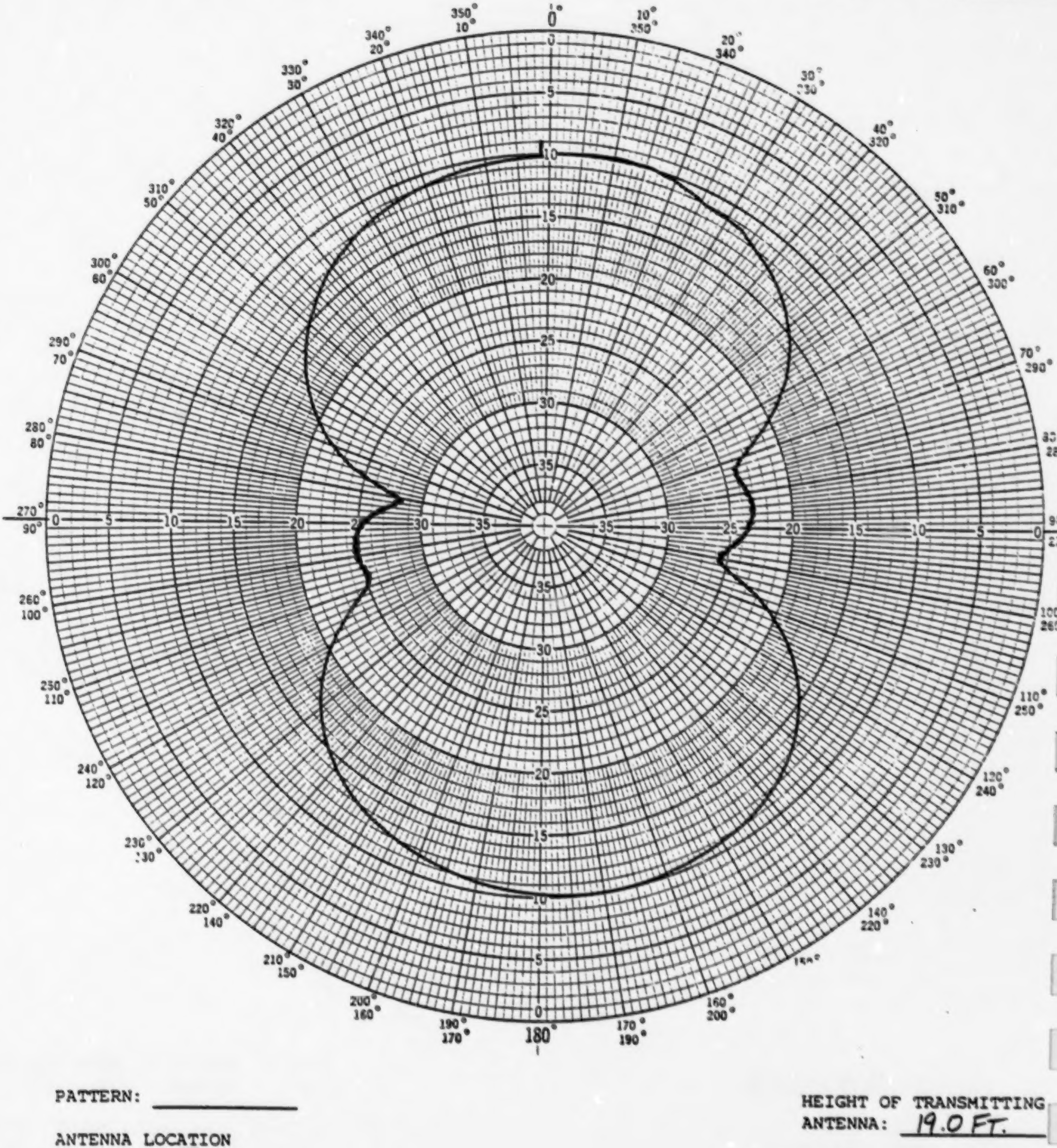
RING RADIUS: 47.5"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FF8



PATTERN: __________

ANTENNA LOCATION ON TOWER: FACE

TRANSMITTING ANTENNA POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING ANTENNA: 19.0 FT.

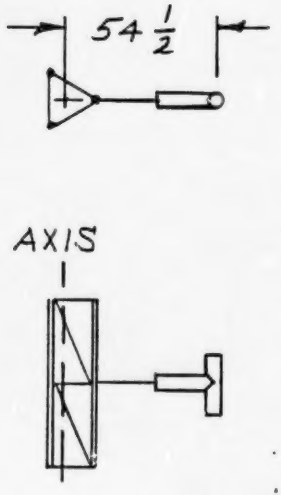
DIST. FROM TRANS. ANT. TO TEST ANT.: 131 FT.

RING RADIUS: 47.5"

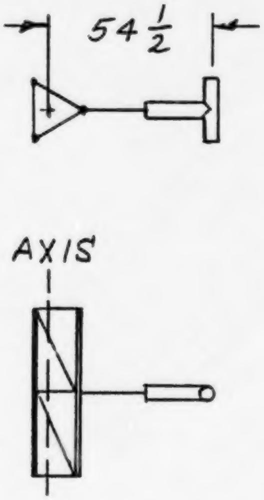
### MODEL "F"
### RANGE CALIBRATION
### ANTENNA MOUNTED
### ON TOWER LEG
### August 11, 1981

| PATTERN NUMBER * | TRANS. ANTENNA HEIGHT (Feet) | PATTERN | DIPOLE ORIENT-ATION | REMARKS |
|---|---|---|---|---|
| FL1 (316) | 16.0 | H-Plane | Vert. | |
| FL2 (317) | 16.0 | E-Plane | Vert. | |
| FL3 (318) | 19.0 | E/H-Plane | Vert. | |
| FL4 (319) | 23.0 | E/H-Plane | Vert. | |
| FL5 (320) | 19.0 | E/H-Plane | +90 | |
| FL6 (321) | 19.0 | ????? | +45 | |
| FL7 (322) | 19.0 | H-Plane | +45 | |
| FL8 (323) | 19.0 | E/H-Plane | Hoz. | |
| FL9 (324) | 16.0 | E/H-Plane | Hoz. | |

*Page Numbers



DIFOLE
VERTICAL



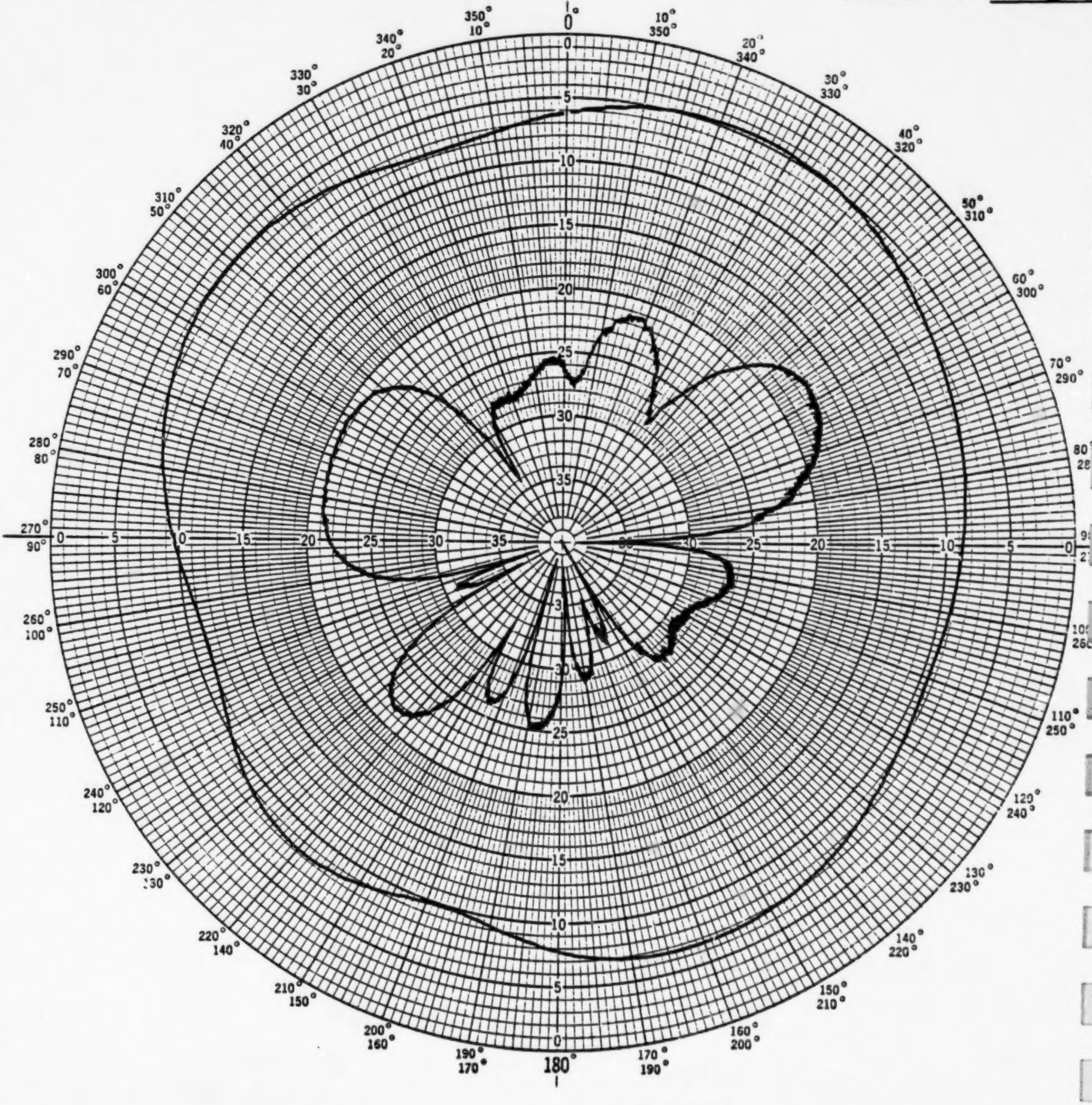
DIPOLE
HORIZONTAL

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FL1



PATTERN: H-PLANE

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: Hoz.

HEIGHT OF TRANSMITTIN
ANTENNA: 16.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

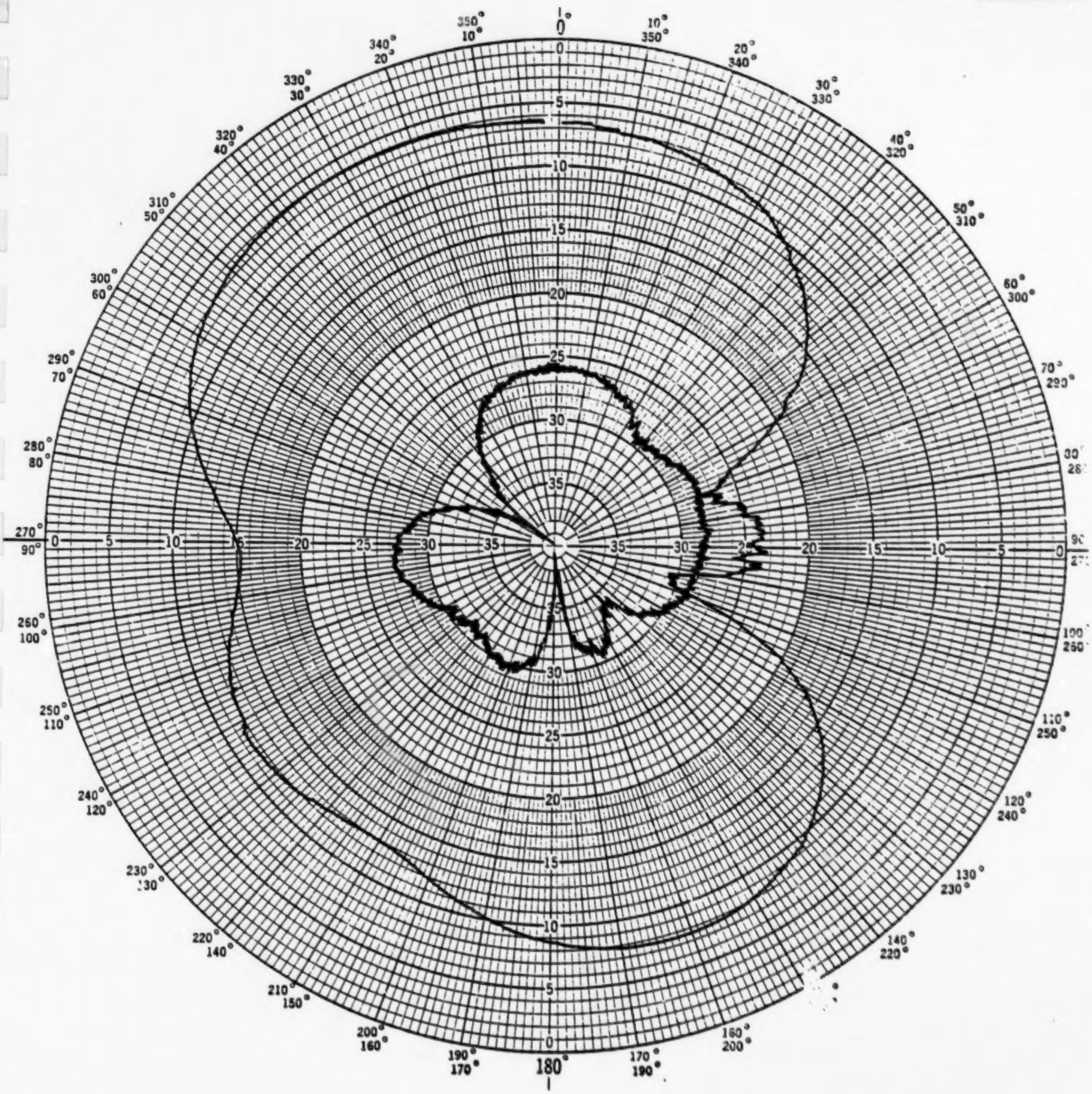
RING RADIUS: 54.5"

Micro
Communications
Inc.

DATE: 8/12/81

MODEL: F

PATTERN NO.: FL2



PATTERN: E-PLANE

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: Hoz.

HEIGHT OF TRANSMITTING
ANTENNA: 16.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

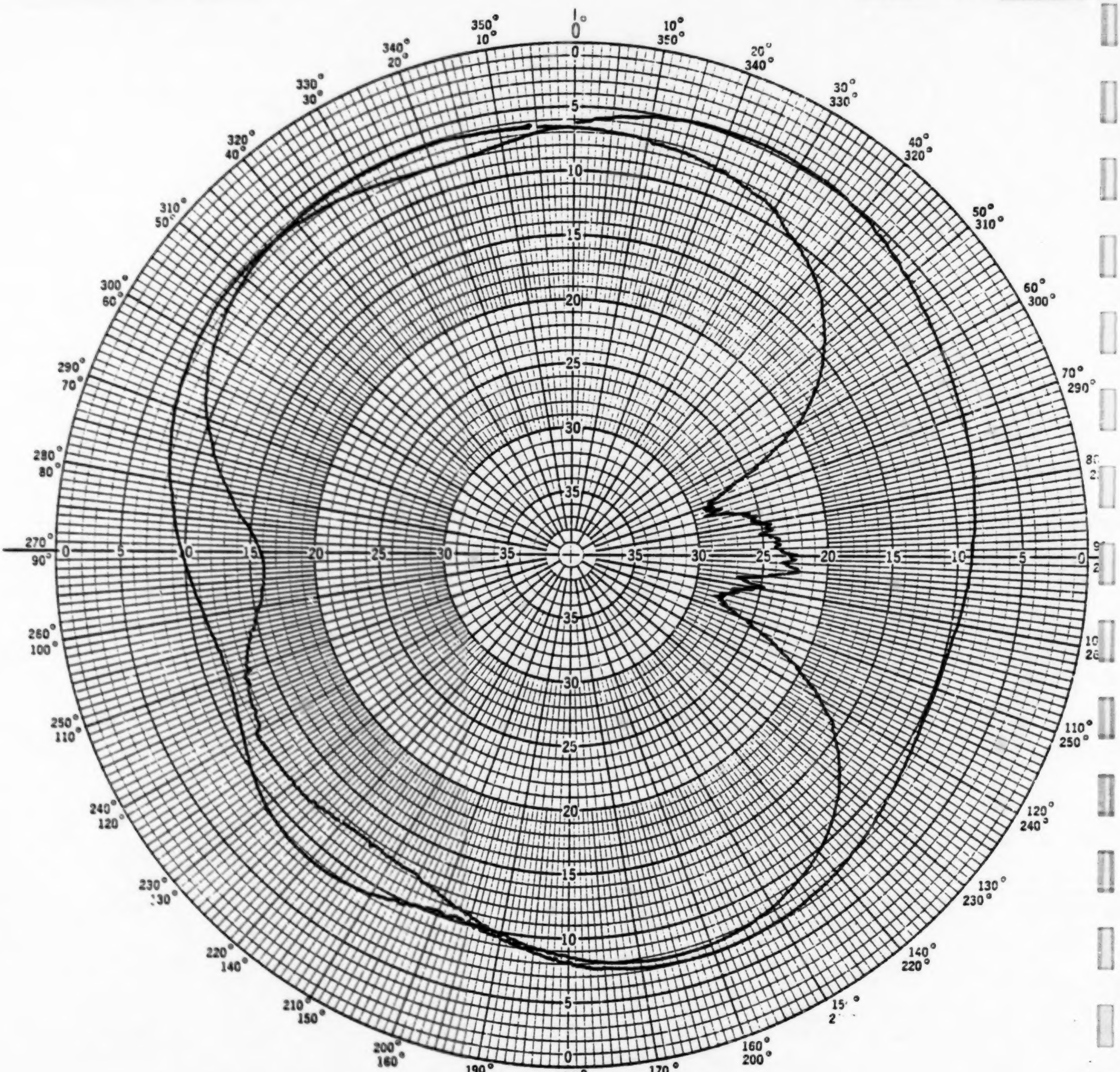
RING RADIUS: 54.5"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FL3



PATTERN: E/H-PLANE

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: Hoz.

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

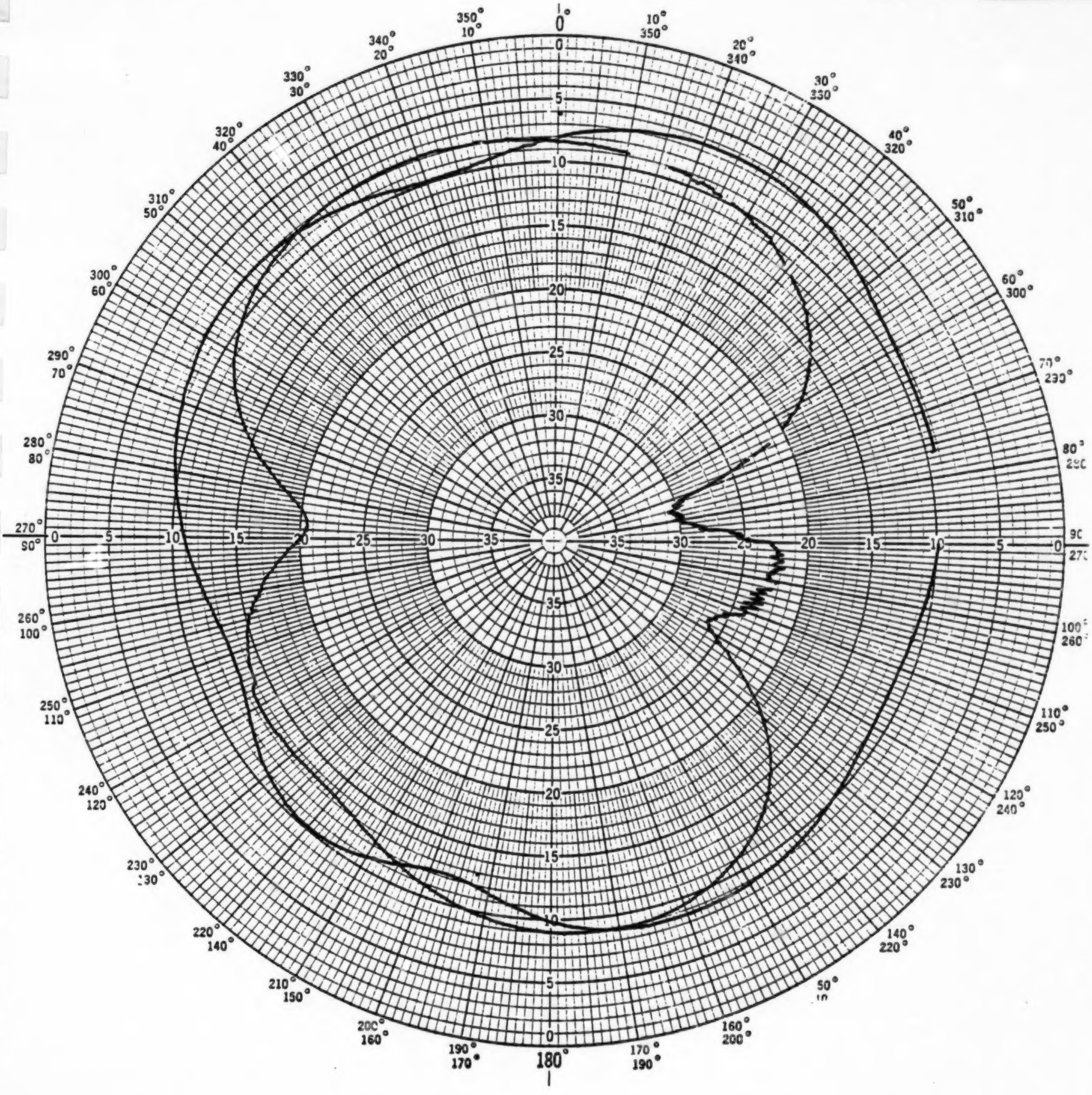
RING RADIUS: 54.5"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FL4



PATTERN: E/H - PLANE

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: HOZ.

HEIGHT OF TRANSMITTING
ANTENNA: 23.5 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT

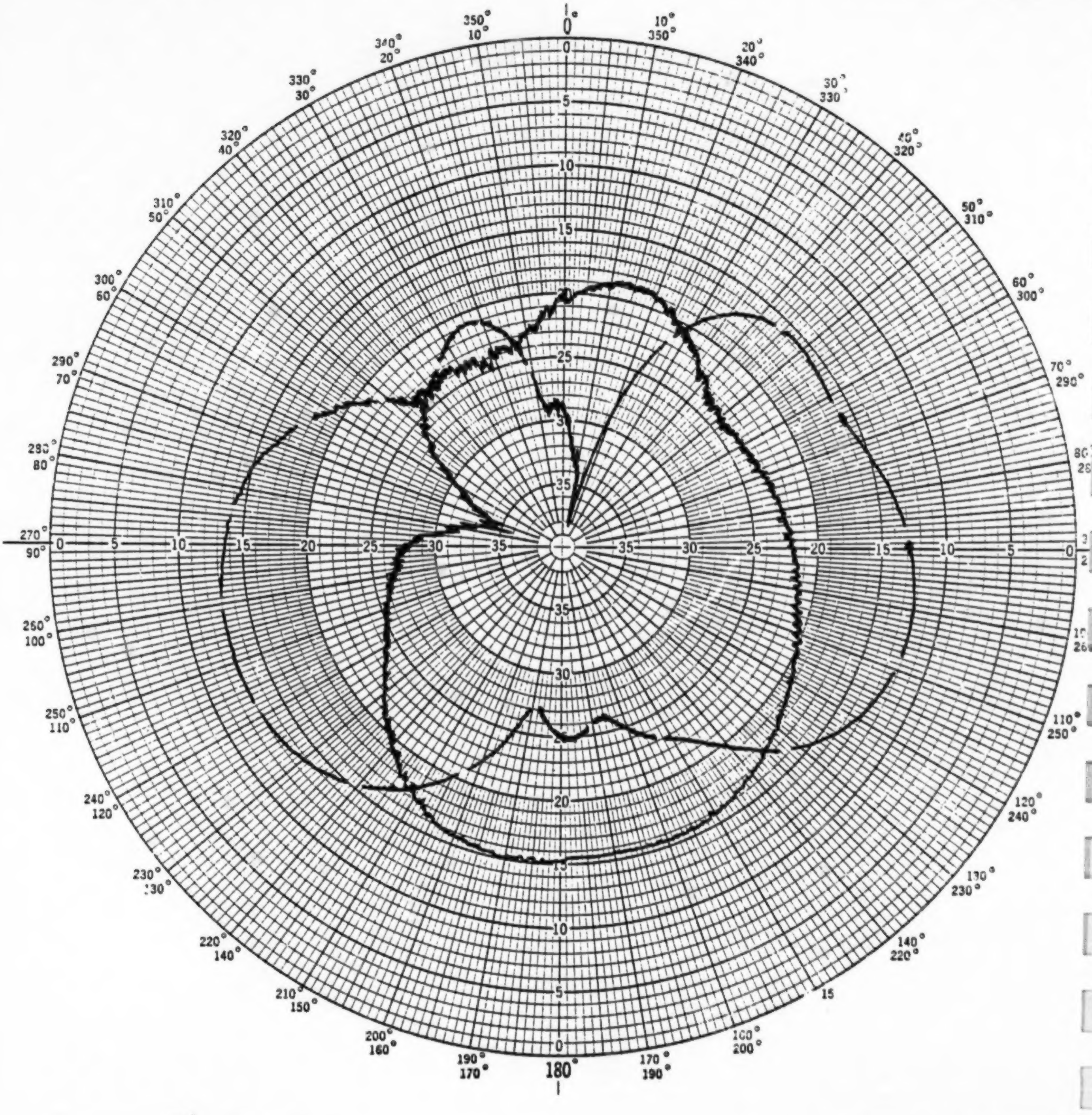
RING RADIUS: 54.5"

Micro
Communications
Inc.

DATE: 8/12/81

MODEL: F

PATTERN NO.: FL5



PATTERN: E/H PLANE

ANTENNA LOCATION
ON TOWER: _

TRANSMITTING ANTENNA
POLARIZATION: ______

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT

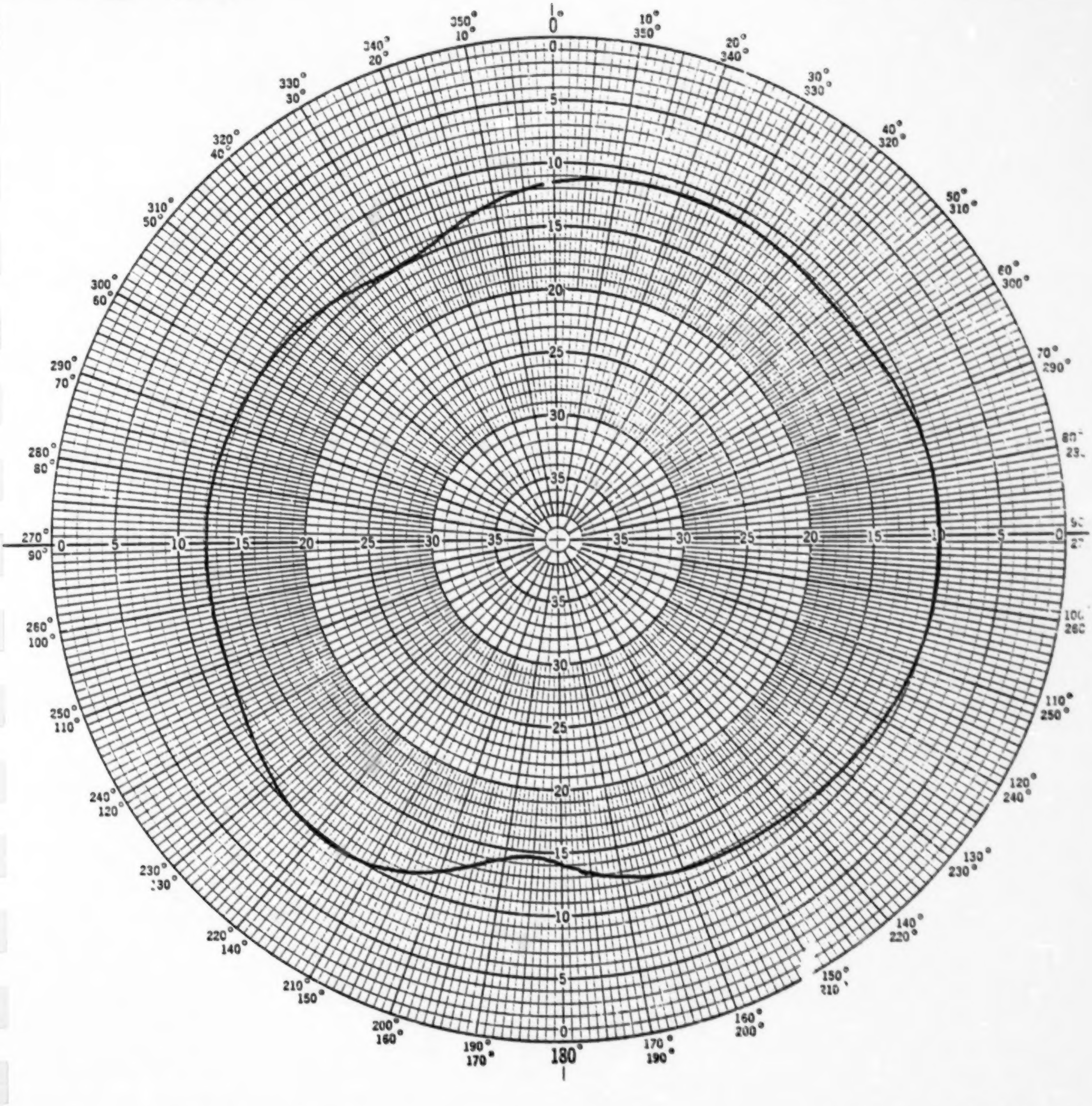
RING RADIUS: 54.5"

**Micro**
**Communications**
**Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FL6



PATTERN: H-PLANE

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: ______

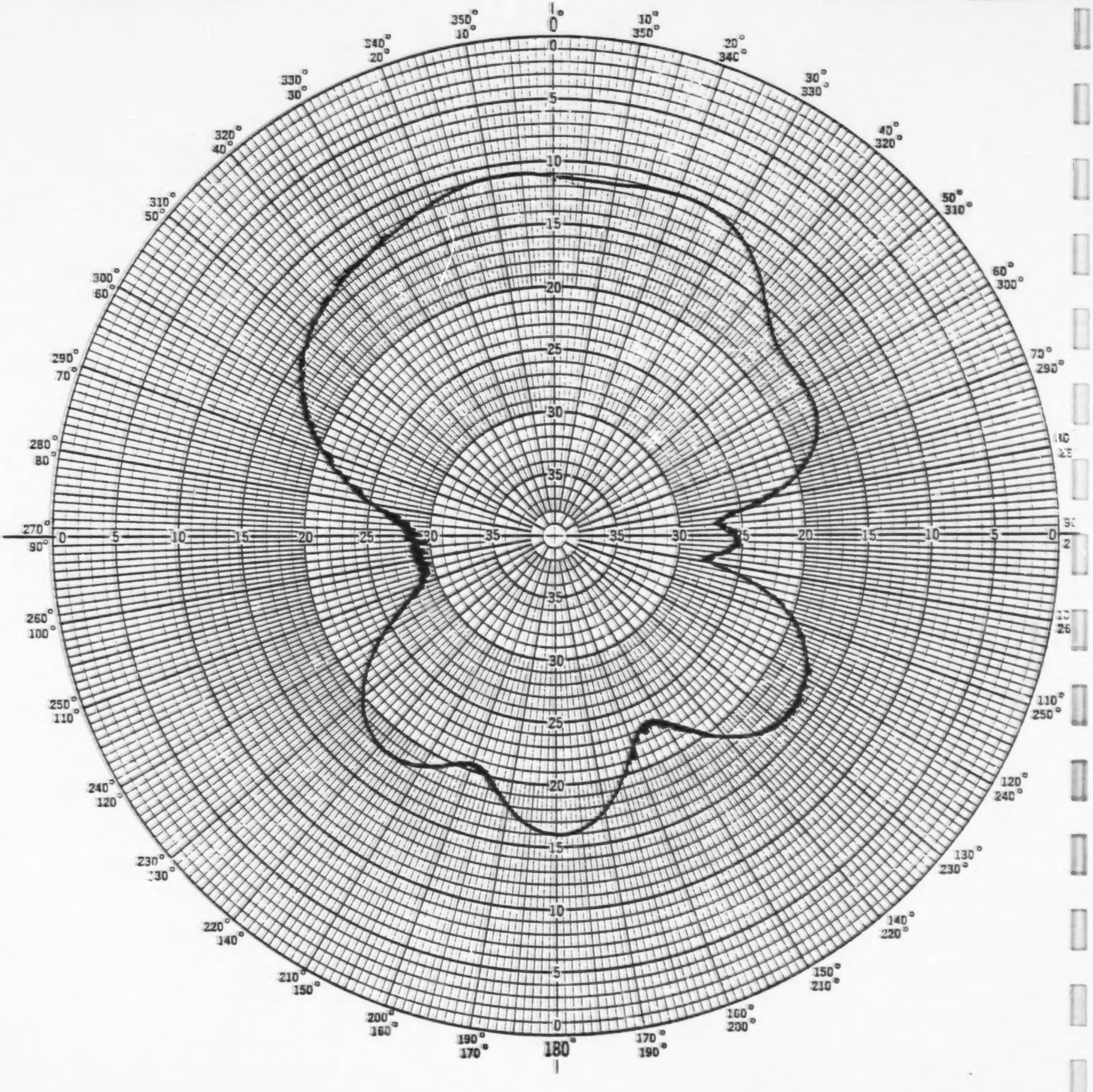
HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 54.5"

**Micro Communications Inc.**

DATE: 8/12/81
MODEL: F
PATTERN NO.: FL7



PATTERN: H-PLANE

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION:

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

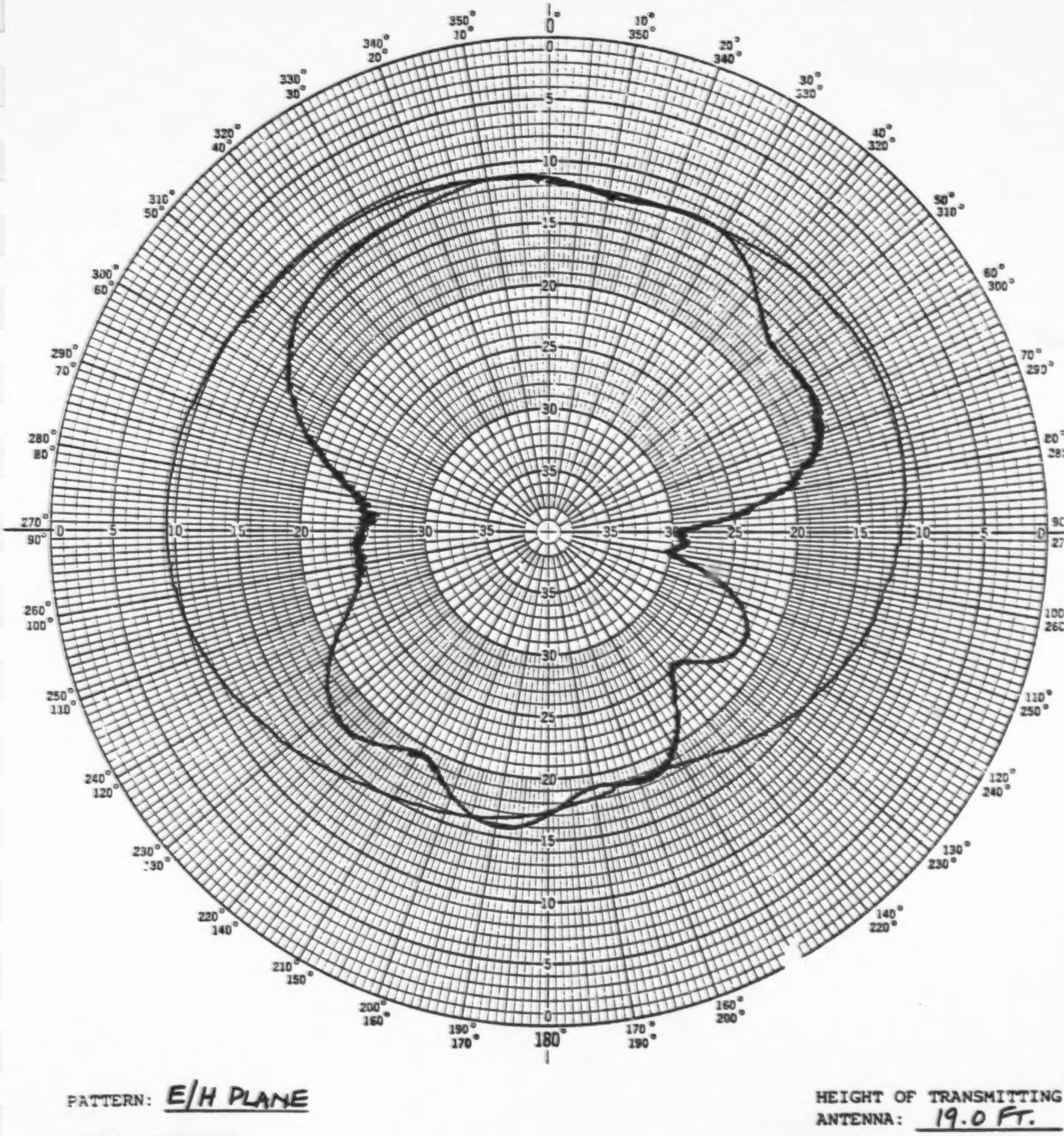
DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT.

RING RADIUS: 54.5"

MCi Micro Communications Inc.

MODEL: F

PATTERN NO.: FL8



PATTERN: E/H PLANE

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT

HEIGHT OF TRANSMITTING
ANTENNA: 19.0 FT.

DIST. FROM TRANS. ANT.
TO TEST ANT.: 131 FT

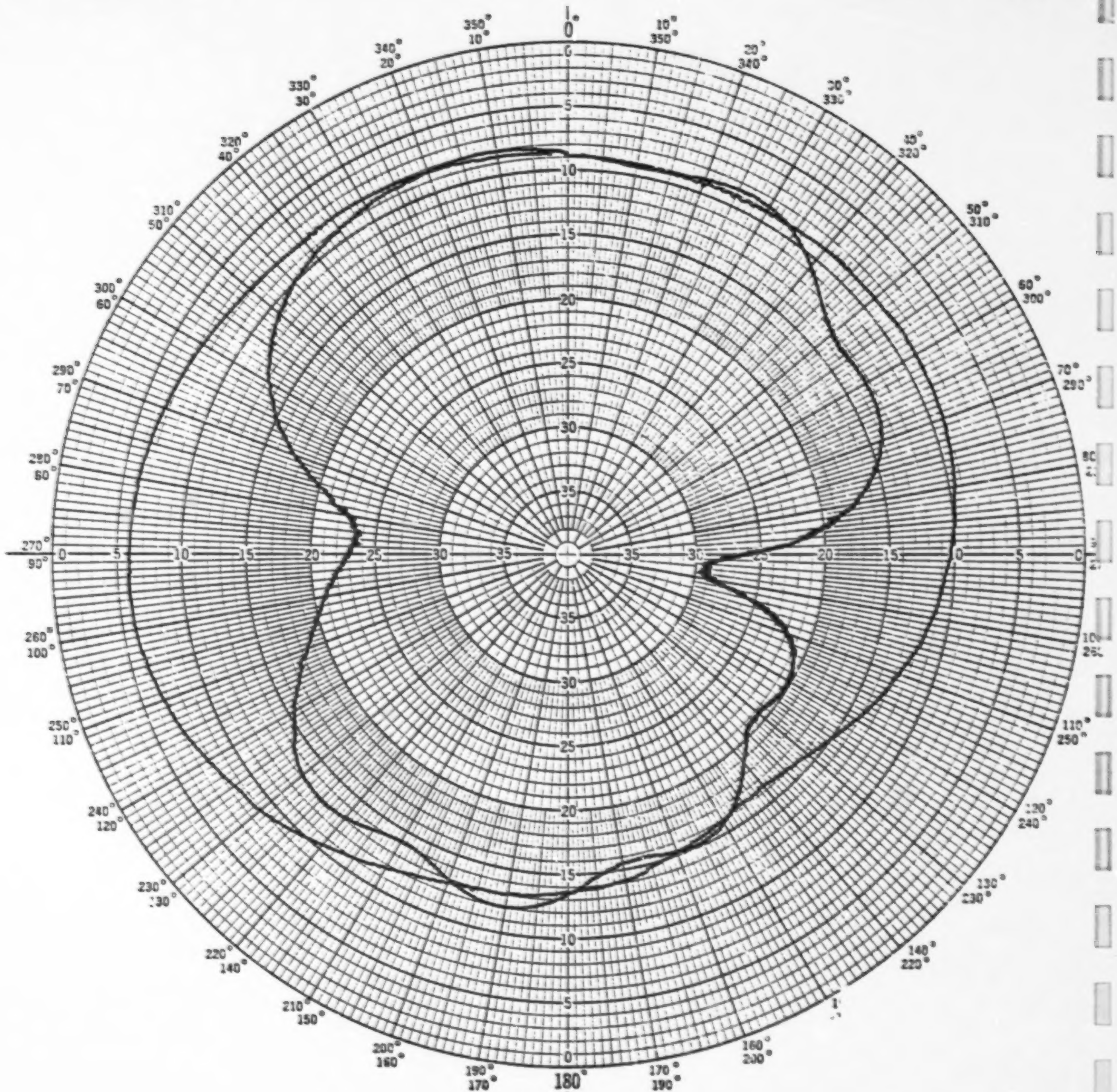
RING RADIUS: 54.5"

**Micro Communications Inc.**

DATE: 8/12/81

MODEL: F

PATTERN NO.: FL9



PATTERN: E/H PLANE

ANTENNA LOCATION
ON TOWER: LEG

TRANSMITTING ANTENNA
POLARIZATION: VERT

HEIGHT OF TRANSMITTINC
ANTENNA: 16.0 FT.

DIST. FROM TRANS. ANT
TO TEST ANT.: 131 FT

RING RADIUS: 54.5"